EIGHTEENTH ANNUAL MEETING

TRANSACTIONS OF THE

Western Surgical and Gynecological Association

Eighteenth Annual Meeting, held at
Minneapolis, Minn., December 29 & 30, 1908

MINNEAPOLIS:
PRESS OF THE JOURNAL-LANCET
1909

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CHAIRMAN COMMITTEE OF ARRANGEMENTS

JOHN P. LORD - - - - - Omaha

3764

EX-PRESIDENTS AND MEETING PLACES

PRESIDENT	PLACE	YEAR
S. S. Todd*	Topeka	1891
Milo B. Ward*	Kansas City	1892
Milo B. Ward*	Des Moines	1893
Lewis Schooler	Omaha	1894
John E. Summers, Jr.	Kansas City	1895
Thomas J. Beattie	Topeka	1896
Joseph Eastman*	Denver	1897
David S. Fairchild	Omaha	1898
Homer C. Crowell	Des Moines	1899
O. Beverley Campbell	Minneapolis	1900
August F. Jonas	Chicago	1901
James E. Moore	St. Joseph	1902
Alex. Hugh Ferguson	Denver	1903
Charles H. Mayo	Milwaukee	1904
Harry D. Niles	Kansas City	1905
Malcom L. Harris	Salt Lake City	1906
Charles W. Oviatt	St. Louis	1907
William W. Grant	Minneapolis	1908

*Deceased.

The Western Surgical and Gynecological Association does not hold itself responsible for, or necessarily endorse, any of the papers printed herein.

ARTHUR T. MANN, Secretary-Treas.

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Executive Session

December 29, 1908—First Day—Morning Session

The Association met in the Library of the Hennepin County Medical Society, Minneapolis, at 9:30 A. M., and was called to order by the President, Dr. W. W. Grant, of Denver, Colo.

On motion of Dr. L. W. Littig, the reading of the minutes of the previous session (1907) was dispensed with, and approved as printed.

Dr. A. E. Benjamin read a paper entitled "Chronic Dilatation and Prolapse of the Stomach."

Dr. D. S. Fairchild, of Des Moines, Ia., followed with a paper entitled "Post-operative Acute Dilatation of the Stomach."

Dr. B. B. Davis, of Omaha, Neb., read a paper entitled "The Surgical Importance of the Intestinal Gases."

These three papers were discussed jointly by Drs. Coffey, Eisendrath, Mayo, Jackson, Andrews, Harris, Byford, Hilger, and, in closing, by Drs. Benjamin, Fairchild, and Davis.

Dr. John P. Lord, of Omaha, Neb., read a paper entitled "Value of Enterostomy in Intestinal Obstruction," which was discussed by Drs. Haggard, Percy, Coffey, Connell, Moore, Dunsmoor, Wright, Collins, Knott, and, in closing, by the essayist.

Dr. W. H. Magie, of Duluth, Minn., read a paper

on "Acute Abscess of the Brain, with Detailed Report of Two Cases."

On motion of Dr. Harris, the Association adjourned until 2 P. M.

First Day—Afternoon Session

The Association reassembled at 2 P. M., with the President in the chair.

Dr. Mayo moved that the President's address be delivered this evening. Seconded and carried.

Dr. Van Buren Knott, of Sioux City, Ia., read a paper entitled "Splenic Anemia," which was discussed by Dr. Mayo and, in closing, by the essayist.

Dr. J. Clark Stewart, of Minneapolis, Minn., read a paper on "Sarcoma of the Fibula."

This paper was discussed by Drs. Moore, Andrews, Davis, Jackson, and, in closing, by the essayist.

Dr. William Hessert, of Chicago, read a paper entitled "Treatment of Tetanus," which was discussed by Drs. Harris, Eisendrath, Connell, Brewster, Mayo, Haines, and, in closing, by the author of the paper.

Dr. E. M. Sala, of Rock Island, Ill., read a paper on "Subserous Appendectomy."

The paper was discussed by Dr. Lord and, in closing, by the author.

Dr. Joseph Rilus Eastman, of Indianapolis, Ind., read a paper on "The Technic of Hare-Lip and Cleft-Palate Operations."

The same was discussed by Drs. Lord, Mayo, Mann, Moore, Pond, Dunsmoor, Grant, and, in closing, by the essayist.

Dr. R. C. Coffey, of Portland, Ore., read a paper on "Plastic Surgery of the Abdominal Wall," which was discussed by Dr. Fairchild.

Dr. F. Gregory Connell, of Oshkosh, Wis., read a paper entitled "Repair of the Internal Ring in Oblique Inguinal Hernia."

The paper was discussed by Drs. Mann, Eastman, Eisendrath, Benjamin, and, in closing, by the author.

Dr. William D. Haggard, of Nashville, Tenn., read a paper on "Abdominal Tuberculosis."

It was discussed by Drs. Jackson, Mayhew, Coffey, Eastman, Davis, Connell, Fairchild, and, in closing, by the essayist.

Dr. Charles H. Mayo, of Rochester, Minn., read a paper entitled "Accidents and Complications in Goiter Operations."

The paper was discussed by Drs. Beck, Sala, Lord, and, in closing, by the essayist.

On motion of Dr. Daniel N. Eisendrath, the Association adjourned until 9 A. M., Wednesday.

Note.—Tuesday evening, December 29, the annual banquet of the Association was held at the Minneapolis Club, when President Grant delivered his address.

DECEMBER 30, 1908—SECOND DAY—MORNING SESSION

The Association met at 9 A. M., and was called to order by the President.

Dr. William J. Frick, of Kansas City, Mo., read a paper entitled "Indications for an Obliterative as Distinguished from Reconstructive Aneurysmorrhaphy."

This paper was discussed by Dr. Lord.

Dr. Daniel N. Eisendrath, of Chicago, read a paper on "Diagnosis and Treatment of Renal Calculi."

The paper was discussed by Drs. Haines, Harris, Davis, Grant, and, in closing, by the essayist.

Dr. Harry P. Ritchie and Dr. Archibald MacLaren, of St. Paul, read a joint paper entitled "The Removal of the Gall-bladder."

Dr. Clifford U. Collins, of Peoria, Ill., followed with a paper entitled "Some Points in the Surgery of the Bile-Tracts."

These papers were discussed together by Drs. Fairchild, Davis, Andrews, Mayo, and, in closing, by Drs. MacLaren and Collins.

Dr. Jabez N. Jackson, of Kansas City, Mo., read a paper on "Pericolitis," which was discussed by Drs. Moore, Sweetser, Courtney, MacLaren, Coffey, Pond, and, in closing, by the essayist.

Dr. W. D. Haines, of Cincinnati, Ohio, read a paper entitled "Gastric and Duodenal Ulcer."

Dr. James E. Moore, of Minneapolis, Minn., read a paper entitled "Mistakes in Diagnosis in the Upper Abdomen."

These two papers were discussed together by Drs. Mayo and Haines.

Dr. A. W. Abbott, of Minneapolis, Minn., read a paper on "Peritoneal Adhesions Above the Pelvis," which was discussed by Drs. Byford, Davis, Fairchild, and, in closing, by the author of the paper.

On motion, the Association adjourned until 2 P. M.

Second Day—Afternoon Session

The Association reassembled at 2 P. M., and was called to order by the President.

Secretary Mann presented the report of the Executive Council, as follows:

REPORT OF THE EXECUTIVE COUNCIL

Minneapolis, Minn., December 30, 1908.

There were present at the meeting of the Executive Council Drs. Harris, Mayo, and Percy.

In the absence of Drs. Oviatt and Niles, Drs. Davis and Hollowbush were appointed to fill their places at this meeting.

The following are recommended for membership:

Arthur C. Stokes.....Omaha
Wilton McCarthy .....Des Moines
J. D. Griffith.....Kansas City
M. T. Saddler.....Lawrence
Robert J. Christie.....Quincy, Ill.
S. C. Plummer.....Chicago
M. G. Seelig.....St. Louis
Arnold Schwyzer .....St. Paul
Gustav Schwyzer .....Minneapolis
Chester H. Sample.....Saginaw

Omaha is recommended as the next place of meeting, and the time December 20 and 21, Monday and Tuesday, 1909.

The following are recommended as officers for the ensuing year:

President.....Arthur L. Wright, Carroll, Ia.
First Vice-President..James F. Percy, Galesburg, Ill.
Second Vice-President.....
.....Willard D. Haines, Cincinnati, O.
Secretary-Treasurer.....
.....Arthur T. Mann, Minneapolis, Minn.
Executive Council.....
C. H. Mayo, to succeed himself, and Jabez N. Jackson, to fill the remaining vacancy.
Chairman of Committee of Arrangements.....
.....John P. Lord, Omaha, Neb.

It is recommended that the name of the Society be changed to read The Western Surgical Association.

The Treasurer's report was approved and is as follows:

TREASURER'S REPORT

RECEIPTS

Balance in treasury December 31, 1907..	$735.49	
Fees and dues to December 26, 1908.....	810.00	
Volume of transactions sold.....	2.50	
Total		$1,547.99

DISBURSEMENTS

Paid for printing	$42.00	
Paid Wm. Whitford for reporting St. Louis meeting	133.72	
Paid for printing and mailing the transactions	509.24	
Paid for postage, express, etc	13.78	
Paid for badges	16.40	
Paid honorarium to secretary	100.00	
Paid Minneapolis Club for banquet	315.00	
Total		$1,130.14
Balance on hand up to December 26, 1908		417.85
Collected for extra banquet tickets		60.00
Dues and fees collected December 26, 1908, to December 30, 1908		495.00
Total balance on hand December 30, 1908		$ 972.85

DR. D. S. FAIRCHILD: I move that the report of the Council be accepted and adopted as read, with the exception of that part which involves a change in the name of the Association. This is a constitutional amendment, and necessarily would have to lie over until next year for action.

DR. M. L. HARRIS: I second the motion.

DR. JAMES E. MOORE: I would move another amendment to that. This Association ought to discuss freely the feasibility of changing the time of our meeting. Of course, we have discussed the subject before, but have been holding our meetings at about this time every year for the last six years, and we have succeeded beyond expectations. Many of us are teachers in medical colleges, and there are many other societies we have to attend, but coming at this earlier date would make it impossible for us to attend some of them because of our teaching duties. I should like to amend that an exception be made to the time of meeting, and that it remain as it is. Seconded.

DR. CHARLES H. MAYO: I would like to speak from

the standpoint of the Councilors. We discussed seriously the question of this change of time. There are about eight members of this Association who are also members of the Southern Surgical and Gynecological Association, and we thought if it was possible to have the meeting of the Western Surgical and Gynecological Association before Christmas, it would not conflict with the duties of those who are teaching, because there is very little school work done in Christmas week, and if the time of the Association could be arranged so that the meeting can be held in the week preceding Christmas week, it would enable those who are members of both associations to attend the two meetings in one trip. This has proven successful with the American Medical Association and the American Surgical Association, as well as with various special associations, and it is thought if we could get this meeting during Christmas week it would be better.

DR. R. C. COFFEY: I believe this is a very important matter, especially to those of us who are so far away. There are very few teachers located in the far West who cannot get to the meeting in a short time, and it would be a great convenience to those who live at a considerable distance, say, from Salt Lake City on to the Coast, if a more desirable time could be arranged.

DR. JOHN P. LORD: Here is a point I think it might be well for us to consider, and that is, that our surgical work does not clear up until up to the holidays, and that there is always more or less work between the holidays, and it is easier for surgeons to get away during this week than it would be before. Speaking for myself, it would have been impossible for me to have attended had the meeting been last week.

The Association then took a vote on the amendment of Dr. Moore, the result being eleven votes cast in

favor of and seventeen against the amendment, which was declared lost.

The amendment to change the time of meeting to December 20th and 21st was accordingly put and adopted.

On motion the Association adjourned until 2 P. M.

SECOND DAY—AFTERNOON SESSION

The Association reassembled at 2 P. M., and was called to order by the President.

Dr. F. A. Dunsmoor, of Minneapolis, Minn., read a paper entitled "The Versatile Omentum," which was discussed by Drs. Eisendrath, Andrews, and, in closing, by the essayist.

Dr. W. E. Rochford, of Minneapolis, Minn., read a paper on "The Surgeon and His Ideals."

This paper was discussed by Drs. MacLaren, Andrews, and Moore.

Dr. George C. Barton, of Minneapolis, Minn., read a paper on "Diagnosis and Treatment of Cancer of the Uterus."

Dr. John E. Summers, Jr., of Omaha, Neb., followed with a paper entitled "The Cancer Question, with Special Reference to the Treatment of Cancer of the Breast."

These two papers were discussed by Drs. Haines, Judd, MacLaren, Rothrock, and, in closing, by Dr. Barton.

THE PRESIDENT: At this juncture I desire to introduce my distinguished successor, Dr. Wright. I will ask Drs. Fairchild and Moore to escort Dr. Wright to the platform.

In the meantime I would like to offer this resolution:

That the thanks of the Association be extended to the City Hospital of Minneapolis for their invitation, and especially to the physicians and surgeons of Min-

neapolis for their very kind and most hospitable treatment of our members.

Personally, I want to extend my thanks to our time-honored Secretary, Dr. Mann, for his most excellent work, and to assure the Association that the past year has been to me one of the pleasantest and most interesting in my professional life. I shall ever regard it as one of the bright spots, and one of the happy ones, in my life, one which I shall teach my sons that the year which has given me most pleasure has been that of the presidency of this Association, with colleagues and friends I have known for many years, and with whom I have constantly worked, and I wish to personally thank you all most cordially.

I desire to present now my long-time, valued, personal friend, and esteemed member of our profession and of this Association, Dr. Wright, of Carroll, Ia., my successor. (Applause.)

Dr. Wright, in accepting the presidency, said:

Mr. President: I wish to thank you most sincerely, gentlemen, for the honor you have conferred upon me, one of the least of your number. This is one of the brightest moments of my life, and if you will bear with me during the coming year with the same patience that has characterized the members of the Western Surgical and Gynecological Association for the past fourteen years, I know that the year will be attended with as much pleasure to me, and I earnestly hope with profit to you, as it has been to my predecessor. (Applause.)

Dr. J. N. Warren, of Sioux City, Ia., read a paper on "Abdominal Pregnancy: Report of a Case, with Operation and Delivery of a Living Child."

The paper was discussed by Drs. Macrae, Summers, MacLaren, and, in closing, by Dr. Warren.

Dr. C. A. Stewart, of Duluth, Minn., read a paper

on "Treatment of Retrodisplacements of the Uterus."

The paper was discussed by Drs. Andrews, Benjamin, and, in closing, by the author of the paper.

Dr. J. W. Andrews, of Mankato, Minn., read a paper on "Colles' Fracture," which was discussed by Dr. Lord, and, in closing, by the essayist.

As there was no further business to come before the meeting, the Association then adjourned, to meet in Omaha on December 20 and 21, 1909.

President's Address

DIAGNOSIS IN ITS RELATION TO THE LABORATORY AND THE BEDSIDE

WILLIAM W. GRANT, M. D

DENVER, COLORADO

The occasion seems appropriate and opportune for the presentation of this important subject, interesting to both physician and surgeon.

In the British Medical Journal of December 28, 1907, Dr. Rolleston, in a visit to this country, expresses himself interestingly as to medical teaching and hospitals here. He says more systematic work is done in the clinical laboratories, but there is a serious lack of routine ward work in the hospitals. The danger is suggested that the thoroughness in the clinical laboratory examinations may lead to less thoroughness in the routine physical examination of patients. Specialism is more extreme, he states, than abroad. I believe this criticism is fair and just. The not infrequent diagnostic errors of internists and surgeons, even those who have had good educational and clinical advantages, show a lack of thoroughness in examinations and close observation of clinical phenomena or failure to deduce rational conclusions.

The schools, and the bearing of many leading men in special work in emphasizing the importance of

pathology and technic to an inordinate degree in comparison with other features of the work, are partly responsible for the absence of painstaking observation and scientific analysis of symptoms at the bedside.

Detailed critical study of the history of cases and the meaning of clinical signs, subjective and objective, are, I fear, not the common practice—even of surgeons. There is too much reliance, even when not necessarily exclusive, upon instruments of scientific precision and upon laboratory diagnoses, and too little upon the training and discipline of one's own faculties in his accustomed work. The result is a few expert diagnosticians in certain departments and a general decadence in diagnostic skill and acumen.

In proportion to the better facilities for teaching and improved educational advantages generally, we should expect equal progress in the ability to observe and understand the causes and the conditions of disease, and we ought to have more, and not so few, skilled diagnosticians. Even in large communities it seems to be accepted, gracefully and satisfactorily, if there are one or two men only who deserve this distinction.

It requires closer study, more time to analyze and elucidate, in order to more rationally interpret symptoms and conditions, than most men seem willing to give to the subject. It seems strange that competent men should commit errors in diagnosis that could often be avoided if well-known resources were employed in the solution of problems common to our experience. The surgeon has deified aseptic and operative technic, the former the common knowledge of the profession, the latter of the individual, and, in considerable degree, varying attribute of each operator. Excellent in these respects, and often in pathological lore, he trusts the balance to the laboratory, seeming to overlook, or to underestimate, the fact that the thorough, compe-

tent surgeon is not only a skillful operator and an intelligent pathologist, but an observer and respecter of many other important and necessary facts in the equipment of an equally skillful diagnostician.

Sound judgment in the many phases of our work is the growth of natural fitness, education, close observation, and the knowledge of laws and facts governing specific and general diseases. A great surgeon is not a mere mechanic: he is, as well, a good physician and a trained clinician. It must be admitted that errors of diagnosis are often due to careless and indifferent examinations, to insufficient time and want of due consideration of all the evidence that might be obtained, and too much reliance upon the probability, or certainty, of the laboratory expert, if one is convenient and available. An exploratory operation is often a short, and sometimes unnecessary, cut to the solution of the difficulty. Being generally a safe procedure, under favored conditions, it is a ready and quick resort, whether an emergency exists or not.

May I be pardoned for citing a few recent suggestive cases of diagnostic interest? A man of 67, of previous excellent health, except a brief but significant history of evidence of gall-stones ten years before, has suffered for eight or ten months from slight indigestion and intermittent diarrhea. He was examined by two first-class physicians and three or four surgeons of equal distinction. A tumor of the epigastrium of considerable dimensions is noted, and a globular swelling, the size of a cocoanut, to the right of the umbilicus and below the edge of the liver, is also recognized. The patient never vomited, though eating solid food, and at no time was there evidence of pyloric stenosis. A test-meal was given with absence of hydrochloric acid. Diagnosis: cancer of the pylorus. With such a history, should it have been necessary for a post-mortem six months later to deter-

mine the presence of cancer of the gall-bladder with gall-stones, secondary involvement of the liver, and no disease of the stomach?

Again: a woman of 65, having uterine hemorrhage and an acrid, offensive discharge, and other clinical evidence of cancer. A surgeon advised hysterectomy. Consultation was held, curettage was performed, and the scrapings sent to a distant pathologist to determine the existence or non-existence of cancer. Was this, for obvious reasons, a wise surgical procedure?

A young woman of 20 falls from the steps of a street car in motion, striking on her abdomen, is laid up for several weeks, and a swelling to the left of the umbilicus gradually develops. It is explored and a large quantity of pus evacuated. A fistula remains and discharges, including urine, for a year. Physicians and surgeons are in doubt as to the source of the trouble. Should an *x*-ray, revealing renal calculi, have been necessary to determine the source and nature of the abscess (pyonephrosis)?

Would an experienced surgeon wait for the demonstration of 20,000 white corpuscles to the cubic millimeter before recognizing a case of post-operative ileus? Would he rest on the opsonic index to determine, as a rule, his course of action in operative work?

A woman of 38, married, never pregnant. Three or four years ago she was examined by a surgeon of good character. The symptoms were persistent pain in the back over the left ilium posteriorly. Diagnosis: tuberculosis of the left hip-joint. She was treated with extension in bed for six months with marked aggravation of pain and nervousness. Pain extended to the thigh, knee, and ankle. Extension was discontinued, and the patient was on crutches for a year. A critical examination of the patient at a more recent date by a surgeon and neurologist revealed absolutely no indication or evidence of tuberculosis, past or pres-

ent, of any part or organ, and no family history of the same. The joint is perfect. There is a distinct neurotic personal and family history. Hemoglobin, 75 per cent. She is anemic and hysterical. The surgical treatment was unnecessary and undoubtedly harmful to the neurasthenia from which she had been suffering.

Such patients are not infrequently over-treated, even by the surgeon sometimes.

A young woman of 26 had acute left-side pleurisy when 8 years old. At 15 pus from empyema ruptured through the bronchial tubes. For the last eight years she has suffered from paralysis of the left leg. She was bedridden two years, and also had disease of the lower dorsal vertebræ with ulceration through the back. Three years ago she was examined by a surgeon of high character, who pronounced the disability of the leg tubercular periostitis of the femur. Thoracotomy was performed one year ago. She was recently examined by the same surgeon who examined her three years ago and a neurologist, when a diagnosis of motor paralysis of the leg is made, due to meningomyelitis from the diseased vertebræ, with no tuberculosis of the femur.

The syphilographer and the surgeon have not often found it difficult to make a diagnosis of hard chancre; but in the future the demonstration of the spirocheta pallida will, I suppose, be necessary to a sure diagnosis, notwithstanding the declaration of Hoffman, Schandin's chief assistant, that only an expert who from familiarity has acquired intuitive knowledge of the morphology, is competent to differentiate the stained forms from other spirocheta bodies. Bloodgood, in a recent review of joint surgery, says: "It seems surprising that for years we (surgeons) have concentrated our attention on the joints, or, as physicians, on some changes in metabolism, and not investigated for the source from which the infections flowed."

These statements and criticisms will apply as justly

to the work of the laboratory as to the unscientific clinical work at the bedside. The busy physician and surgeon cannot do much of the immense laboratory work now required, even if equipped for it, though few are; but its findings are essential to a high degree of diagnostic efficiency and to the most scientific practice of our art. The knowledge of the internist is necessary to the surgeon. He is far from accomplished without it; and it is of the utmost importance to the patient that the physician should know enough of surgery to differentiate between a medical and a surgical condition. The very exclusive specialism which treats these qualifications lightly seems forgetful of its own needs and the full measure of its obligation.

In those fine differential distinctions, especially in the diagnosis of pancreatitis, cholelithiasis, and duodenal and stomach ulcers, there are no laboratory tests by which the diagnosis can be made, nor are there any conclusive clinical tests; but both are helpful and necessary to a just conclusion. The Cammidge test, like the test-meal, the Widal and other tests, are aids, only in the scientific solution of the many problems which confront us in the efforts to discover the cause and nature of disease. The microscope, unless directed by a knowing hand and balanced by a scientific spirit, could not have given renewed distinction to the Paris school of medicine and to the names of Capitan and Professor Cornil, who made the pathological examinations and a diagnosis of interstitial nephritis, which is consistent with the clinical history, in the case of Admiral Paul Jones one hundred and thirteen years after his death.

Far be it from me to underestimate, in the slightest degree, the absolute necessity and the great value of the laboratory to the progress of medicine. It is the very basis of our greatest achievements, and it is the force which has immortalized, among the many, the names of Pasteur and Koch, and which has honored

and glorified the profession wherever the science of medicine is known. But the instruments of scientific precision are not always accurate and reliable. So much depends upon the motive power and the genius behind the instrument that we can only be content with real, and not half-baked, experts, in order that our scientific conclusions may rest upon a scientific basis, and our efforts have a practical value. With this knowledge and equipment applied at the bedside, and with common sense, fortified by observation and experience, we should be able to secure a satisfactory history, to make a more complete and intelligent examination, and to interpret symptoms and signs with more skill and judgment.

Science is not the exclusive property of the expert, nor the necessary product of the laboratory. Our aim should be, not to produce fewer experts in research work, but more scientific clinical experts and diagnosticians. This I believe necessary to the broader culture and usefulness of the profession, as well as to the best welfare of the sick. Surgery, as a study, is not exclusive, though the practice may be. A narrow view of the subject is not conducive to the best education, nor to the most thorough equipment. The personal equation is of the greatest moment, but great surgeons are not made by imitation, and skill in diagnosis is a protean product that can never be measured by the rod and the plumb.

CHRONIC DILATATION AND PROLAPSE OF THE STOMACH

ARTHUR E. BENJAMIN, M. D.,

MINNEAPOLIS, MINNESOTA

The disease known as *dilatation of the stomach* is now engaging the attention of the medical and surgical world. The association and relative importance of gastric prolapse is also being recognized. Recent investigations have demonstrated that reported deaths due to heart failure, gastralgia, acute indigestion, angina pectoris, etc., may have been due to acute dilatation of the stomach.

The various terms applied to acute dilatation of the stomach, such as gastromesenteric ileus, post-operative gastric paralysis, etc., indicate that the pathology, etiology and modus operandi of this form of dilatation are not universally or thoroughly understood.

From personal observations, investigations, and study of the subject of acute dilatation of the stomach, the writer has come to the conclusion that there are preëxisting conditions to be reckoned with in tracing out the true cause of this disease. Important among these conditions are chronic dilatation and prolapse of the stomach. Kussmaul and Albrecht, judging from their writings, are of this opinion.

The necessity of determining a chronic prolapse or dilatation, or both, in a case to be operated upon should be apparent. Where both exist, as is frequent-

ly the case, it is often impossible to say which is primary and which is secondary.

A knowledge of a chronic dilatation and prolapse before operation would lead to a recognition of a post-operative acute dilatation early, and cause to be instituted the proper line of treatment at once, thereby avoiding the calamity which is bound to occur in a certain percentage of cases not so early diagnosed.

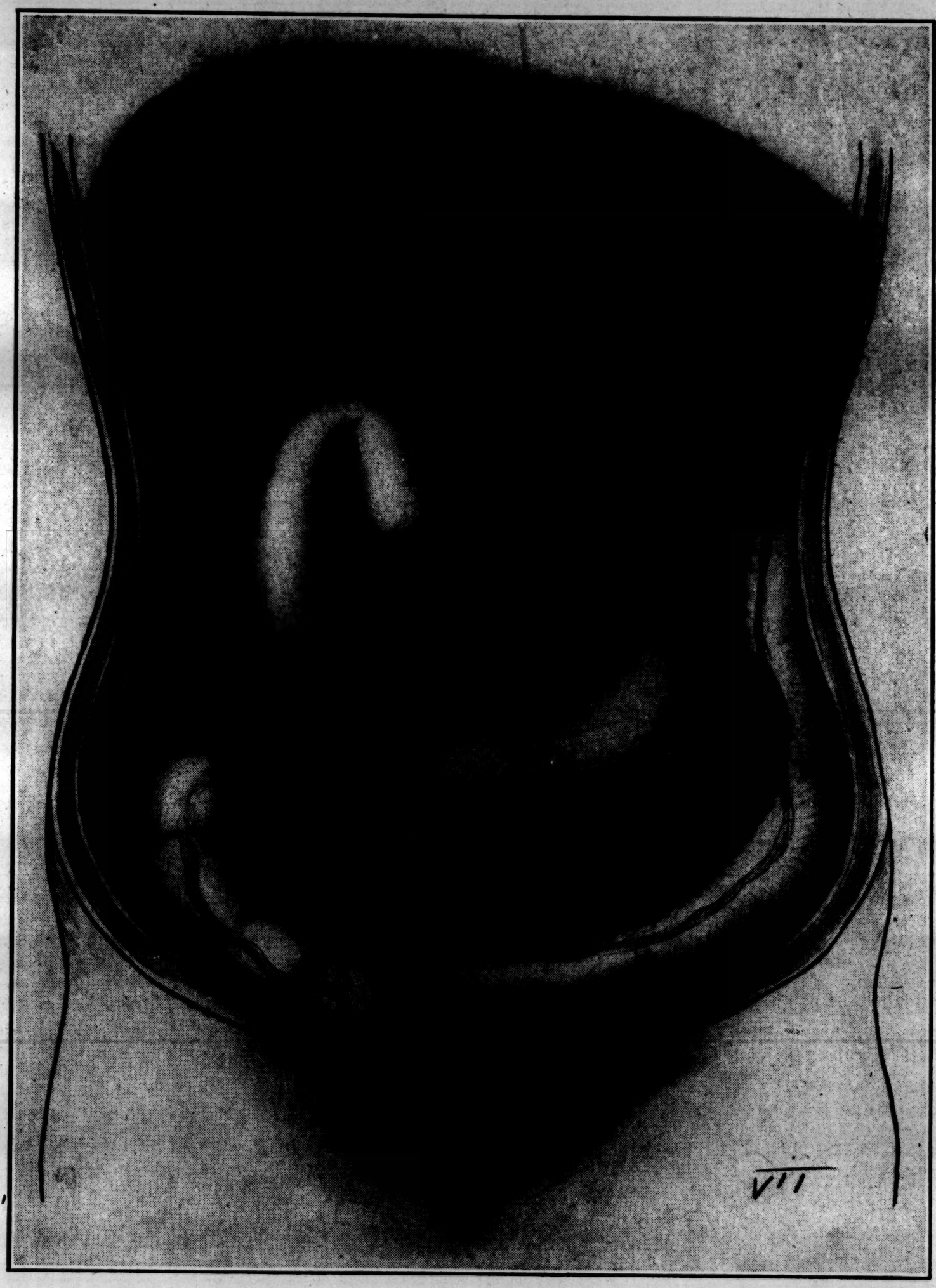
The reflex symptoms in chronic dilatation and prolapse of the stomach are so variable as to be often diagnosed symptomatically as neurasthenia, hysteria, reflex neurosis, nervous dyspepsia, indigestion, etc. This fact offers additional reasons why we should get at the bottom of this condition and thoroughly analyze the complex symptoms, as well as the true significance of this state of abnormality.

CAUSE

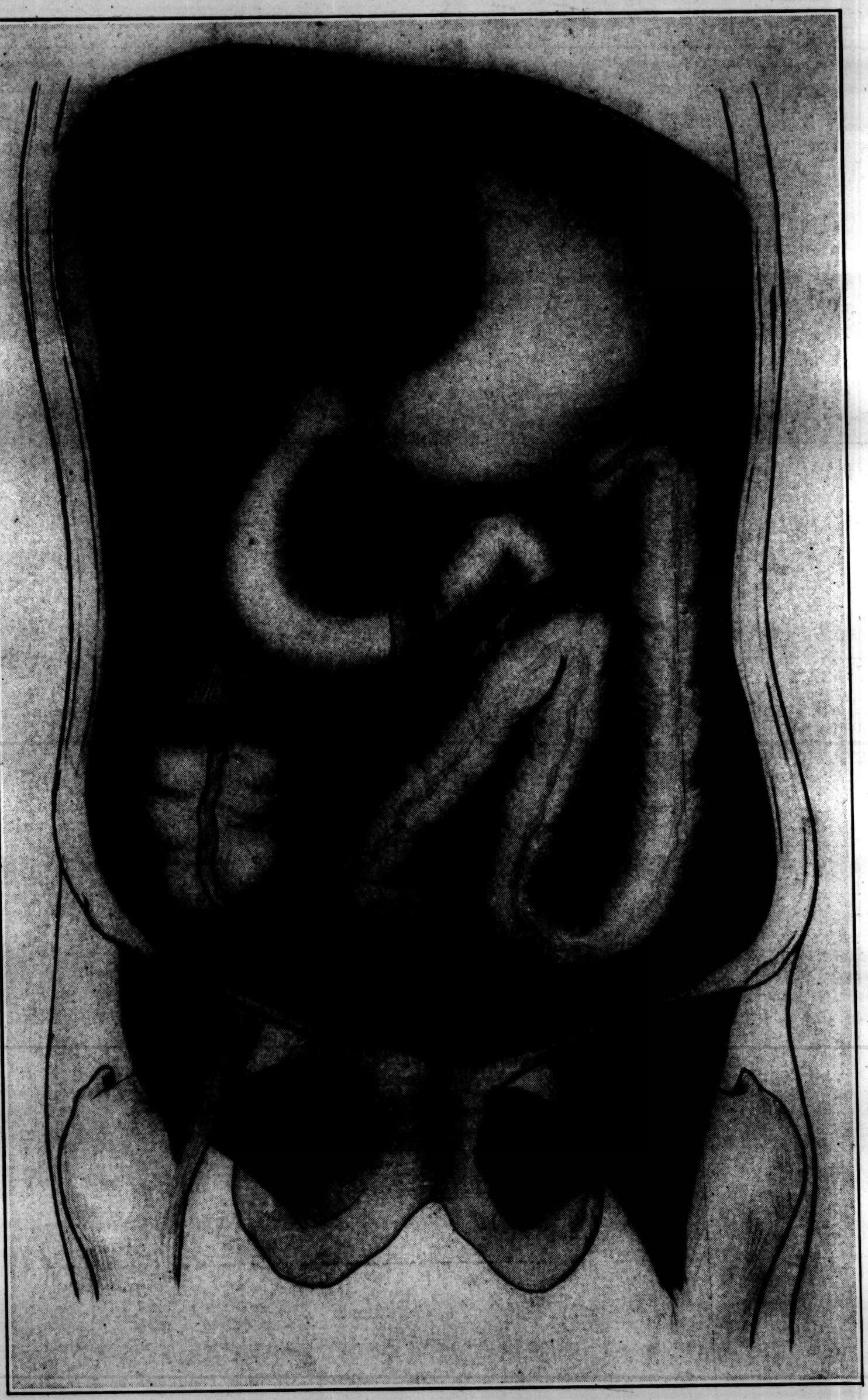
In many instances the primary causes of chronic dilatation and prolapse are the same. In some cases there is a prolapse followed by a dilatation of the organs due to kinking at the pylorus, or there may be a dilatation due to frequent overloading of the stomach with bulky and heavy foods which weigh the organ down, especially in standing, causing a stretching of the gastrohepatic ligament.

Gastroptosis itself renders difficult and delayed the expulsion of food, hence dilatation. Gastroptosis is frequently present without dilatation; especially is this noticed in young women who have "laced." It is also occasionally noticeable following childbirth or the removal of any large abdominal or pelvic growth, owing to the relaxed muscles—a visceroptosis, which in consequence leads to a gastroptosis.

These causes may begin even in childhood, where great quantities of bulky fermentable food and drink are habitually allowed children. The "pot belly" is often seen in such individuals, especially in children



Sagging of the stomach.



Duodenum obstructed by the mesenteric vessels.

with weak abdominal muscles and otherwise thin and anemic for want of hygiene. The fermentation, with gaseous distention of the stomach and intestines, soon leads to chronic motor insufficiency and atonic dilatation or dyspepsia, especially if there is not a compensatory muscle hypertrophy of the stomach.

Deficient peristalsis allows a stagnation of the food, which may remain in the stomach many hours too long for want of expulsive force. The presence of undigested particles of food results in decomposition and inflammation, or catarrh of the stomach, which produces an unhealthy condition of the stomach-wall, and this may possibly lead, in many instances, to ulcers or even cancer, e. g., the tissue breaks down easily or allows of malignant infection. The disease state of the stomach may be a degeneration of the muscle fiber, paresis of the gastric nerves, or actual organic disease of the muscles.

According to Walter B. Laffer, in acute dilatation there are inhibitory disturbances affecting the brain, cord, or nerve paths connecting the stomach with these centers.

A chronic dilatation may arise from obstruction at the pylorus or along the duodenum. A partial stenosis from healed pyloric ulcers, constricting bands of ad hesions from a local peritonitis, gall-stones, and perigastric inflammation, etc., are some of the principal causes. That a floating right kidney can and does produce obstruction of the duodenum in some cases cannot be denied. Bortles, Bettmen, Litten, Ewald, and others believe this. A prolapsed liver may drag the stomach down, or a heavy transverse colon may do so.

The mesenteric vessels may constrict the duodenum, resulting in a dilatation of the proximal portions of this viscus and secondarily the stomach.

Kussmaul called attention to the possibility of a chronically dilated stomach caused by its weight press-

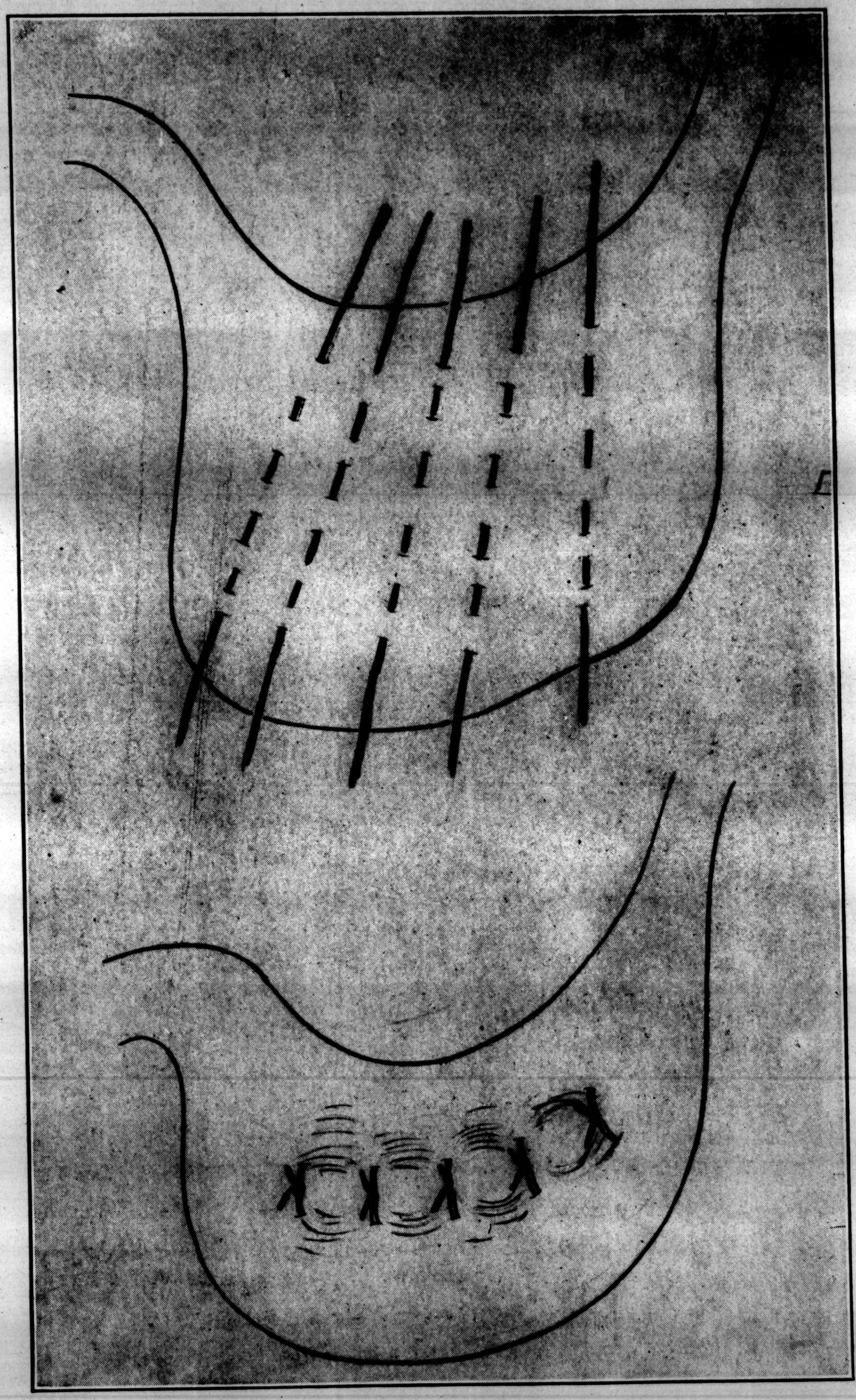
toms at times are quite alarming and can be mistaken for appendicitis with possible peritonitis.

The acute symptoms usually subside after the kink or spasm of the pylorus is relieved and the gas finds its way along the intestinal canal, but leave the patient quite weak.

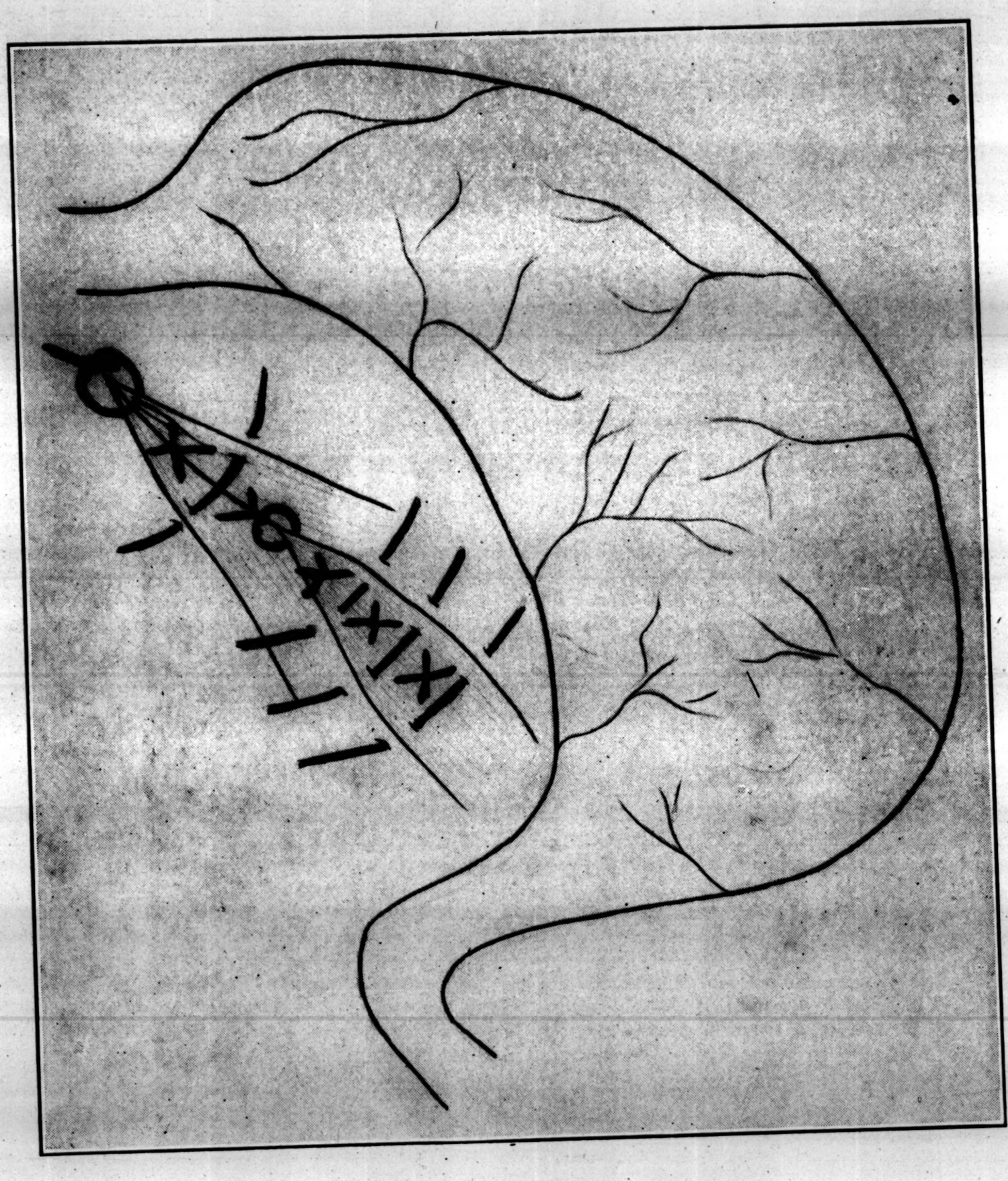
The sagging of the stomach becomes marked in persons habitually taking a second meal before the last one has been expelled from the stomach. Thirst, poor appetite, and vomiting are noticed in later cases. When there is quite an obstruction at the pylorus or along the duodenum distention becomes very marked and prolapse quite apparent. The patient becomes weaker, vomiting and faintness are experienced, and emaciation quite pronounced.

DIAGNOSIS

The diagnosis of chronic dilatation or prolapse of the stomach at the present time can be readily made out by various known methods. When the greater curvature is found to have altered its level as on a line with the navel or below it, dilatation of the stomach may generally be assumed to exist. Pacanowski has shown that the greatest vertical diameter of gastric resonance in the normal stomach varies from 10 to 14 cm. in the male, and is about 10 cm. in the female. Dilatation with gas or air followed by percussion is the usual method of diagnosis, but the giving of bismuth and the subsequent taking of an *x*-ray photograph is more exact. In some cases the abdomen is large and prominent below the navel. The outline can in some cases be plainly seen with the small curvature below the ensiform cartilage. Actual peristaltic waves may be seen passing from left to right where there is much obstruction of the pylorus in individuals with thin abdominal walls. A careful history of the case will reveal much, e. g., symptoms of indigestion extending over a number of years and other symptoms above mentioned. A great



Bircher's operation for dilatation of the stomach.



Beyea's operation for gastropexy.

many of the individuals suffering with this complaint are hard-working wives of farmers with relaxed abdominal muscles and a general visceroptosis.

Palpation may elicit a splashing sound, which can be obtained whenever there is much liquid and air in the organ, three or four hours after eating.

By auscultation a sizzling sound is present, not unlike that heard when the ear is placed over a soda-water bottle when first opened.

Mensuration may be used by passing a hard sound into the stomach until the greater curvature is reached. Normally it rarely passes more than 60 cm., measured from the teeth, but in cases of dilatation or prolapse it may pass as much as 70 cm.

In determining whether there is a prolapse or dilatation of the stomach it is quite necessary that we should have a clear idea of what the terms imply. There is no question but what a number of individuals go through life with a prolapsed stomach who have few or no symptoms. We should also have some fixed landmark to depend upon in outlining the position of the different portions of the stomach.

Dr. Henry K. Pancoast says that in an *x*-ray study of 100 cases of gastroptosis he has cleared up a great many misunderstood conditions, and his article is so important that I take the liberty of quoting quite extensively from it. By the *x*-ray he has been able to determine—

1. Abnormalities in position, such as ptosis.
2. Abnormalities in size, such as contraction or dilatation.
3. Abnormalities in shape, such as the "hour-glass" stomach.
4. Abnormalities in motility.
5. Retention.

He says that one of the most noticeable features of ptosed stomachs to be observed when making a col-

lective radiographic study of gastroptosis is the tendency they all have to follow certain distinct types.

In this classification five distinct types of gastroptosis are recognized, and for convenience he added as a sixth type, the anatomically normal stomach.

1. The normal stomach.
2. The transitional type of gastroptosis.
3. The anatomical type.
4. The tubular type.
5. The sagging type.
6. The dilated type.

1. *The direction which the stomach takes.*—Its general tendency is to lie obliquely and nearer to a horizontal than a vertical direction.

The cardiac end is never concerned in the mechanism of ptosis, as it is practically a fixed point.

The normal position of the pylorus may vary from a point somewhat to the right of the midline to as much as two inches to the right. Its normal position is on a level with the first lumbar vertebra. It is conclusively proven by the skiagraph that the pylorus is invariably to be found at a lower level in the presence of gastroptosis. It has been observed in some instances to lie as low as the fifth lumbar vertebra.

The greater curvature, in the skiagraph of the normal stomach, is found to lie at a variable distance above the level of the lower border of the third lumbar vertebra, but in extreme ptosis it may drop almost to a level of the symphysis pubis.

Aside from its cardiac attachments the main support of the stomach is the gastrohepatic omentum. Relaxation or stretching of this suspensory ligament is one of the most important factors in the mechanism of gastroptosis. If this structure fails in its mission the performance of its duty falls upon the pyloric attachments, with the possible result of a pyloric "kink."

A ptosis or an enlargement of the liver will have some influence upon the position of the stomach. The

relations of the stomach and the transverse colon are such that each may influence the position of the other under certain conditions imposed by a ptosis of either.

2. *The "transitional" type.*—In the cases in which the very earliest stage in the development of gastroptosis may be observed, at such a period, the condition would be practically unrecognizable except by means of the *x*-ray examination.

3. *The "anatomical" type.*—Gastroptosis is present in a great number of instances when there are no subjective manifestations or clinical evidences of its existence. Such a ptosis is to be regarded as relative only, or, as we have classed it, "anatomical." The anatomical type may be either a premonitory stage of a true pathological ptosis, such as a lack of the normal support from a slightly relaxed gastrohepatic ligament, or a rather widely movable or unusually low pylorus; or the stomach may be pushed down by a ptosed or enlarged liver; or ill-placed by a distended colon; or dragged down by a ptosed transverse colon.

4. *The "tubular" type.*—In this type the two important factors directly concerned in the mechanism of the ptosis are a low pylorus. The pylorus is usually displaced more or less to the left and is always found at a very low level anatomically. The characteristics of this type are the marked ptosis, the low pylorus, and the uniformly tubular shape of the stomach.

5. *The "sagging" type.*—In this type the two direct primary factors in the mechanism of ptosis of the preceding type are also operative, but they are reinforced by the additional one of dilatation, which, through a stretching and weakening of the muscular coat, permits the stomach to sag downward in the erect posture from the weight of its contents in the most dependent portion. Therefore dilatation is always present, the position is vertical. The amount of displacement of the pylorus varies greatly, and it may be found extremely low. Retention is favored and the pyloric

"kink" is likely to be produced, especially when the pylorus is relatively high compared to the level of the most dependent portion of the fundus. A relaxed gastrohepatic ligament is particularly to be inferred in the presence of a kink. Symptoms are always prominent and severe.

6. *The "dilated" type.*—In this type dilatation is the predominating feature. Although the ptosis may still conform in some respects to one of the preceding types, still the dilatation may be so extreme as to destroy all resemblance to any of them.

Relaxation of the muscular coat is suggested by the presence of dilatation, the sagging type of ptosis, and by lessened motility and retention, when they are not due to obstruction.

TREATMENT

Treatment divides itself into the medical and the surgical. The exact location and position, form and variety of prolapse, or dilatation should be demonstrated by the *x*-ray or gas-distention, etc., in order to formulate the treatment to fit the case if possible.

Atonic dilatation of the stomach, not dependent upon any mechanical obstruction at the outlet, in cases of gastroptosis with no particular sagging or kinking or pyloric obstruction, or when the convex border in the sagging variety does not fall below the umbilicus, is, as a rule, a subject for medical treatment, massage, diet, belts, electricity, and position.

In cases with relaxed abdominal muscles, muscle exercise, especially of the lower portion of the abdomen, for the purpose of strengthening the muscles and elevating the abdominal contents, is essential. A stomach distended with gas or containing some food residue, may be made to empty itself into the duodenum by such exercise and assisted by position and elevation of the hips at times, which takes the weight off the mesenteric supports, the relief may be immediately noticed. Such a stomach may regain

a great deal of its normal tone, especially if not overdistended with food, drink, or gas. A long, straight-front corset worn in these cases elevates the abdominal organs and especially the stomach, so that much relief is thereby experienced. Stomach washings are also beneficial in individual cases.

A stomach prolapsed, except the oblique type, two or more inches below the navel in a person past middle life, is not apt to regain the normal position and tone, especially if there is a long history of discomfort, by the simpler methods of treatment. Surgical intervention is justifiable, and, in fact, offers the only hope of marked relief. Where there is a possible pyloric scar or kinking or obstruction an operation is certainly indicated. Cancerous growths are occasionally suspected in some of these cases, but often not found at operation.

SURGICAL TREATMENT

Gastroplication may be necessary in extreme dilatation. If the pyloric orifice admits the tip of the index finger there is no necessity for having another opening, and gastropexy, not gastro-enterostomy or gastro-duodenostomy, is the operation of choice. When the gastrohepatic omentum is very friable the substituting of interrupted sutures, approximating the lesser curvature of the stomach with the upper border of the lesser omentum at its junction with the liver, holds the organ in place. The stomach stitches include the serosa and muscularis, and are placed just below the attachment of the lesser omentum.

The more operative conditions to be met in ptosis of the stomach are kinking of the pylorus and marked dilatation. In these cases the value of the *x*-ray, in determining the difficulties in the case, is very great, for by this means one can usually estimate the amount of kinking at the pylorus.

In some cases the Beyea operation is of great value,

especially if there is not associated ptosis of the transverse colon. If this is present, it may be necessary, after shortening the supports of the stomach, to relieve the stomach of the extra weight of the transverse colon by suspending it by means of the omentum, as in the Coffey operation. Dr. Coffey, however, employs this operation in prolapse of the stomach and transverse colon, as well.

Beyea's operation for gastropexy consists in shortening the gastrohepatic omentum or suspensory ligaments. In this operation the mobility of the stomach is not interfered with. I generally use chromic catgut sutures instead of linen, unless the stomach-wall is included in cases with a weak, thin, and friable gastrohepatic omental tissue.

The operation of gastroplication for dilatation of the stomach, suggested by Bircher, consists in folding inward a portion of the stomach wall to reduce the size of the much dilated organ. A scarification of the serosa and the use of chromic catgut sutures as illustrated in the figure is very satisfactory.

I have used Beyeas and Bircher's operation in several cases with marked results. Gully, Hagen, Webber, etc.

These operations, while objected to by many, have the advantage of decreasing the size of the stomach and elevating it so that the food does not become stagnant. The stomach is drained, and fermentation is less possible, so that a healthy condition of the stomach mucosa recurs, and a better muscle tone results. When the stomach once returns to this healthy state again with care in diet, exercise, etc., a relapse of the

old trouble is not likely. It may be necessary in some cases with relaxed abdominal walls, as in women, to overlap the walls to make them strong enough to sustain the organs within. This operation is very beneficial in women who have borne several children with no abdominal muscle tone left.

A short-loop gastro-enterostomy may be necessary if there is a benign obstruction at the pylorus with dilatation prolapse. The sutures method is preferable, using linen thread as the first row and chromic catgut outside.

It is important that the surgeon should have supervision of these cases for several months following operation. A too early release from the surgeon's care vitiates the results in many cases, especially is this true in the class of cases under consideration. Failures will more frequently follow unless the surgeon recognizes these points and carefully supervises the subsequent treatment of all these cases. The important points to consider are the proper regulation of all foods, the use of a careful binder or corset, exercise, general hygiene, etc.

CONCLUSIONS

1. Gastric dilatation and prolapse are often interdependent and associated.

2. As possible antecedents of an acute dilatation, they must be recognized.

3. As factors in the causation of ulcers or cancer they should be considered.

4. The causes for dilatation or prolapse may be similar, and they are primarily often due to indiscretion in diet followed by weakened gastric support, muscle inefficiency, enervation or partial obstruction.

5. The diagnosis of the exact variety of ptosis or dilatation should be determined if possible.

6. The treatment should depend upon the conditions found.

7. Simple cases are often remediable by medical and mechanical means, such as diet, exercise, hygiene, etc.

8. Certain cases should be operated upon, especially if obstruction of the sagging type, and other cases not relieved by other mentioned means.

9. Certain cases are dependent upon an associated visceroptosis and relaxed abdominal walls. These should be properly treated to bring about the relief dependent upon such a general prolapse.

10. The Beyea operation alone or supplemented by the Coffey operation, if there be an associated sagging transverse colon, should be done.

11. Chronic dilatation of the stomach, when not otherwise helpful, is greatly benefited and often cured by the Bircher operation.

12. Chronic dilatation dependent upon a benign pyloric obstruction or kinking, a short-loop gastrio-enterostomy should be performed.

12. In certain chronic dilatations dependent upon a benign pyloric obstruction or kinking, a short-loop gastro-enterostomy should be performed.

FOR DISCUSSION, SEE PAGE 63

POST-OPERATIVE ACUTE DILATATION OF THE STOMACH

DAVID S. FAIRCHILD, M. D

DES MOINES, IOWA

Mrs. A. came under my observation at Agatha Hospital December 28, 1906. She had been operated on by Dr. D. S. Fairchild, Jr., eight days before for a large ovarian tumor. Mrs. A. was a rather frail woman, 40 years of age, and had enjoyed fairly good health until a few months before the operation, when the presence of the tumor began to cause her trouble on account of its size. She had for years been annoyed by "stomach trouble," but not of a serious nature, and nothing to suggest the later developments.

There were no operative difficulties. The tumor, while large, was not adherent, and convalescence was uneventful until seven days after the operation. On the evening of the seventh day she had some rise of temperature, distention of the stomach, and unsuccessful efforts at vomiting. She suffered so much distress that the stomach-tube was used and a large amount of dark offensive fluid removed, followed by very decided relief for a few hours, when all the distressing symptoms returned. I saw her on the following morning. At that time the lower part of the abdomen was flat, but in the epigastric region there was a great distention corresponding exactly to the position of a much distended stomach. This was at

once recognized as an acute dilatation of that organ. The temperature was 102°, pulse 124, and she was much prostrated. I was informed that the condition appeared without any marked premonitory symptoms, and the temperature and pulse record showed a suddenly developing toxemia. I had had no previous experience with a similar condition, but I recalled some cases recorded in medical literature and particularly the chapter on acute dilatation of the stomach in Mayo Robson and Moynihan's work published in 1901. Most of the cases reported up to that time had proved fatal, and the condition of our patient indicated very strongly that a similar result would follow. At this time the temperature was 102°, pulse 124 and very weak, and the patient was very restless and much prostrated. The stomach-tube was again used, and a large quantity of dark offensive fluid removed, with much relief to the patient. The temperature dropped to 100° and the pulse to 106.

Inquiry was made to discover, if possible, if there was any pyloric or other obstruction in any part of the intestinal tract. Her bowels had moved even that very morning. Her appetite had been fairly good; and up to the beginning of the present symptoms the food had been digested well and had escaped freely through the pylorus. There was also no distention of the bowels, nor was there at any time during her sickness. The success of the stomach lavage gave hope of a recovery. In about four hours the above related symptoms returned and were again relieved by the stomach-tube. Each time before the tube was introduced there was a rise of temperature followed by a fall soon after the stomach was washed out. The woman died forty-eight hours after the symptoms first appeared. Gastro-enterostomy was apparently the proper treatment, but before her friends could reach her she was so much prostrated that any operative treatment could not be considered.

The cause of the acute dilatation of the stomach in this case was regarded as some form of toxemia exercising a neuroparalytic influence on the stomach. No post-mortem could be secured. The interest excited by this case led to a careful examination of the literature at hand on acute dilatation of the stomach, and neither at the time nor since have I entertained the belief that any form of obstruction was an etiological factor.

The recent papers by Joseph C. Bloodgood (Annals) of Surgery, Nov., 1907) and Walter B. Leffer (Annals of Surgery, March, 1908) would at least suggest that several causes may be productive of this condition. It appears that Dr. Fagg was the first to describe acute dilatation of the stomach. His paper was based on two cases in his own practice which proved fatal. Several papers followed Dr. Fagg's communication. In Mayo Robson and Moynihan's book on the stomach, published in 1901, it is stated that four cases of acute dilatation of the stomach occurred in the Leeds Infirmary. It appears that all these cases followed operations and rapidly proved fatal. The cause was regarded as a toxic neuroparesis. More recent papers, however, appear to show that a wider range of cases have been included so as to embrace a class following operations, designated post-operative, acute dilatation of the stomach, apparently due to different causes, in many cases to some mechanical obstruction in the upper intestine.

The earlier cases were regarded as a neuroparesis. Pepper and Stengel suggested that the immediate cause is a neuroparesis of the stomach probably associated with a spasm of the pylorus. Later writers have added other factors in producing acute dilatation of the stomach, as arteriomesenteric ileus, gastromesenteric incarceration, and other conditions more or less nearly allied, which in many instances are related to post-operative cases, yet not limited to this class, but also

included others not following surgical operations, as, for instance, Glenard in 1885 described mesenteric ileus when the empty small intestines prolapsed into the pelvis and exerted a pull on the root of the mesentery.

The particular and close relation of the symptoms of acute dilatation of the stomach to abdominal operations very naturally leads to the hypothesis of obstructive lesions in the upper intestines, and it is probably true that many are of this nature; but other factors must be taken into account, as in our case and in others like it. The symptoms are too acute from the first, and the rapid prostration and death quite clearly indicates the difference.

The cases referred to in Dr. Bloodgood's paper illustrate both a toxic cause and an obstruction. A case referred to by Dr. Bloodgood as coming under his observation in March, 1904, following an operation for appendicitis, presents a clinical picture of a neurotoxic cause. Another case by the same observer was diagnosed as primary gastromesenteric ileus upon which a jejunostomy and the passing of a tube into the duodenum was done. The patient died two hours later. Post-mortem examination failed to show any changes from the normal. It would seem from reading of the acute dilatation of the stomach and duodenum, that a neurotoxic influence involved the duodeno-jejunal junction.

The third case in Dr. Bloodgood's paper seems to have been practically of the same character. Three cases were therefore of the nature of a primary acute dilatation following operations, while the remainder were secondary to obstructive conditions in the upper intestinal tract, mostly gastromesenteric ileus.

Dr. Leffer reports in his paper four cases of his of which three died. The first case followed a normal confinement, the first symptoms appearing an hour after the child was born. The second case followed

an infection of the antrum of Highmore. The third case followed an operation for an acute appendicitis. The history in this case seems to indicate that the dilatation was secondary to a peritonitis. This patient recovered as soon as the gas passed freely. The fourth case was a cystitis and pyelitis, following the use of a catheter in a paralytic. Death resulted in twenty-four hours after the first appearance of the dilatation of the stomach.

It appears from the observations thus far made that acute dilatation of the stomach may be designated post-operative or otherwise, according to its relations to surgical operations, and may fairly be divided into three groups: 1, toxic neuroparalytic; 2, gastromesenteric ileus; 3, from peritonitis. The first group may be regarded as primary dilatation and the second and third groups as secondary acute dilatation.

The mortality from the first group is very high. According to Kayser, eliminating all cases of gastromesenteric ileus and all cases of mild peritonitis, the death-rate is 71 per cent.

The treatment of post-operative acute dilatation of the stomach will depend upon the pathologic factors involved. Bloodgood's observations on operative treatment were not at all encouraging, as of the ten operated upon eight died and two recovered. He admits that the obstructive factor is not an entirely satisfactory etiology of the condition and that the true cause cannot be said to be established.

The gastromesenteric ileus cases are better treated by the exaggerated Trendelenberg position than by operation, and the neuroparalytic cases better by the stomach-tube than by the gastro-enterostomy.

If the diagnosis between the two conditions cannot be made the treatment may be conducted by both position and the stomach-tube. Seeling, in the "Interstate Medical Journal," mentions a case in which the stomach-tube gave temporary relief, but only after

placing the patient in the exaggerated Trendelenberg position did the symptoms satisfactorily improve. This was probably a case of gastromesenteric ileus, in which position overcame the twist. Dr. Leffer in his first case placed his patient in the Trendelenberg position for other reasons without benefit. This may be assumed to have been a case of neuroparesis.

Beck's observations demonstrated that, in addition to gastroparalysis, there is another factor to be taken into account, viz., a hypersecretion, indicated by the large amount of material removed by the stomach-tube. In a case of his own although the patient had had no food, from one to two quarts was removed every twenty-four hours for four days. The patient recovered. In our case the same observation was made, only that the quantity was much in excess of the quantity above mentioned. Nearly as much was removed every three or four hours.

I take it that Beck's observations have been repeated in nearly all of this class of cases.

FOR DISCUSSION, SEE PAGE 63

THE SURGICAL IMPORTANCE OF THE INTESTINAL GASES

BYRON B. DAVIS, M. D.

OMAHA, NEBRASKA

To avoid one of the most trying post-operative conditions with which the abdominal surgeon has to deal (meteorism) calls for a thorough acquaintance with the physiology of gas-production. The literature of the subject unfortunately is scanty. Little experimental work has been done. The conclusions of those who have investigated along these lines are decidedly contradictory, and many important questions remain unanswered.

Intestinal gases are very important in the production of regular bowel movements. They stimulate peristalsis and tend to keep the intestines distended, contributing much to the looseness of the ingesta and of the fecal matter. Lacking the normal amount of flatus the fecal masses would not pass along the intestinal lumen readily and would irritate the mucous lining. We all recognize the important office the flatus fills as an aid to defecation. It furnishes the propulsive impulse without which easy defecation is impossible.

Fries, speaking of the significance of the intestinal gases, says: "We can best conjecture and ascribe to them a rôle of usefulness in the scheme of digestion and assimilation of the food, in that this gas mixture may serve as a regulating agency to regulate the

growth of microörganisms in the digestive tract, checking the growth of some, preventing the growth of others, which may find their way into the intestines."

The gases principally found are carbon dioxide, marsh gas, nitrogen, hydrogen, and hydrogen sulphide. The various sources of the intestinal gases are summed up by Evans as follows: "(1) air swallowed; (2) gases transferred from or secreted from the blood; (3) gases arising from the fermentation of food-stuffs." Although apt to consider only the fermentation of food as the source of the gas it is likely that the amount furnished by the air swallowed and that secreted from the blood constitute no inconsiderable portion of the total.

Gastric flatulence is thought to be caused frequently by the air swallowed with the food or saliva. In support of this opinion Evans has shown that the nitrogen in the gases of such cases occurs in about the same proportion as in atmospheric air, and that carbonic acid gas is present in like proportion as the oxygen in the air. Furthermore, Evans concludes that "the rapid production of intestinal gases after abdominal operation, in peritonitis and gastritis, in hysteria, and in certain affections of the lungs and heart, renders the theory of an excretion of gases from the mucous membranes of the intestines exceedingly probable."

Fries, in a series of experiments on his own person, found that the composition of the gas discharged from his rectum was as follows:

$C O_2 = 10.3$ per cent by volume.
$O = 0.7$ per cent by volume.
$C H_4 = 29.6$ per cent by volume.
$N = 59.4$ per cent by volume.

He believes the large proportion of free nitrogen to be due chiefly to the atmospheric nitrogen swallowed

as air with the liquid and solid food and with saliva, the oxygen having been absorbed into the blood or to some extent having supplied living organisms in the alimentary canal with oxygen.

That the food ingested is the most important source of the intestinal gases is probable from the fact that when an exclusively meat diet is used the proportion of free nitrogen in the rectum is more than three times as great as when a vegetable diet is made use of. It is well known that certain articles of food cause the elaboration of large quantities of gas while others have the opposite effect.

According to Boas the amount and kind of gas formed vary with the diet and the segment of bowel. It is formed most rapidly where active fermentative changes occur, i. e., in the upper segments of the small intestine. Less gas is formed in the lower portion of the small intestine and very little in the large bowel.

If all the gas formed remained for any length of time in the intestines, painful tympany would quickly result. A certain amount is discharged from the rectum daily. Certain of the gases, notably oxygen, are absorbed into the blood, and several investigators (Regnault, Reisert, Tacke, Kuntz, and others) have demonstrated the presence of marsh gas and other intestinal gases in the expired air (Boas).

In perfect health there is a definite relationship between the amount of gas produced and the amount eliminated. When, because of a gas-forming diet, an unusually large amount is produced, a correspondingly large amount is passed from the rectum, absorbed into the blood, and eliminated by the lungs. When a diet low in gas-producing quantities is ingested there is a corresponding decrease in the elimination. The balance is maintained, and the intestinal canal contains regularly the amount needed to stimulate per-

istalsis and to serve mechanically to speed the bowel contents on their way.

If elimination is not quite up to normal or if gas-production is excessive, a note of alarm is sounded by uncomfortable distention. If at this time a cathartic be taken or the amount of ingesta reduced the normal condition is soon restored.

The rôle which the microörganisms play in the elaboration of gases is little understood, but it is supposed to be an important one. Many physiologists claim that the presence of certain kinds of putrifying as well as other kinds of bacteria is absolutely necessary for continuous good health and normal digestion. If conditions arise inimical to the proper development and activity of these microörganisms, more or less serious results will follow. The bacterial activity is supposed to aid in the production of certain enzymes necessary in normal digestion as well as in the elaboration of gases.

In refutation of the opinions advanced, that much of the nitrogen and oxygen (carbonic acid gas) in the alimentary canal results from swallowed air, Evans, in some experiments with fishes, found that the gas present in the sound of the cod, not connected in any way with the intestinal canal or with the external air, and therefore entirely a product of the vascular lining, consisted entirely of oxygen and nitrogen in the proportion of about 15 per cent of the former to 85 per cent of the latter. He asserts that we have no right to assume when we find nitrogen in about the same proportion as it exists in the air, that that nitrogen is the nitrogen of the air. It is thus seen that the views of different observers are sadly at variance.

Nothnagel is of the opinion that by diffusion carbonic acid gas may pass from the blood-vessels of the colonic intestinal wall into the intestinal lumen. This

would, according to Pick, in a measure explain the sudden occurrence of meteorism after emotional excitement, as it would not be impossible that psychic irritation might influence the vasomotors to such an extent as to favor diffusion.

On the other side we find Lauder-Brunton and Cash, who explain the flatulency of emotional excitement as due to diminished gas-resorption by the vessels of the intestinal walls from inhibition of the venous circulation. Their experiments at least show that carbonic acid gas and sulphuretted hydrogen, which are soluble in water and in alkaline fluids, are taken up by the blood. It is thus seen that many questions in the physiology of gas-production and elimination are yet unsettled.

A clear understanding of the pathology is manifestly impossible as long as the physiology is unknown. Some experimentation has been undertaken to elucidate the cause and process of abnormal gas-formation, but only a few facts have been fully determined. Normally, as has been said, a balance is maintained between the quantity of gas elaborated and the quantity evacuated. If, for any reason, the production greatly exceeds the elimination flatulence and distress result. If any obstructive lesion of the bowel or paretic condition of the intestines interferes with the expulsion of the gas from the rectum, or if circulatory or other disturbance of the coats of the intestines retards or stops the absorption of gases, the effect is very serious. Boas states that, under pathological conditions, the quantity and composition of gases in a given segment will vary from the normal. It will depend on the nature of the contents, the motility of the bowels, and the condition of the circulation.

In estimating the manner in which gas accumulations manifest themselves in the presence of various pathological conditions with which we have to deal a

rather full abstract of the experimental work of Kader will be helpful. He found that in the colic of horses circulatory disturbances were a frequent and important etiological factor. Ninety to ninety-four per cent of horses suffer from aneurism of the anterior or, more rarely, the posterior mesenteric arteries and their branches. The aneurisms cause thrombosis and emboli of the various ramifications of these arteries, which lead, unless a sufficient collateral circulation is established, to the following changes: arterial anemia in the excluded area followed by a venous stasis with serous and hemorrhagic transudation into the intestinal wall and lumen as the result of the lessened blood-pressure. This conditon leads directly to paralysis of the intestines. The latter, in turn, produces stagnation of the intestinal contents with abnormal fermentation and abundant development of gases, and, further, is the cause of axial torsion and invagination of the intestines, because the actively motile healthy portions of intestine wind around the passive portion and become invaginated therein.

Kader produced in dogs, cats, hogs, sheep, rabbits, and horses various forms of intestinal occlusion, and studied the meteorism in relation to its etiological factors of production, localization, and size. He divided his experiments into four groups:

1. In which the intestinal loop with its mesentery was strangulated.

2. In which a certain portion of the intestine was entirely stenosed at two widely separated points, without injury to the mesenteric vessels.

3. In which circulatory disturbances were occasioned in a section of intestine by ligation of its mesenteric vessels, without in any way affecting the intestinal lumen.

4. In which the lowermost loops of the ileum were subjected to circulatory disturbances by ligature of

their mesenteric vessels, as in group three, and by stenosis of the loop of the ileum, immediately above, any influx of intestinal contents from above being prevented.

Results of the first group in which intestinal loop with mesentery was strangulated (1) *moderately and* (2) *completely.*—An almost immediate symptom in moderate strangulation of an intestinal loop is a dark, reddish-blue discoloration, increasing in intensity. It is the result of the venous hyperemia, which increases continuously, leading to venous stasis and extravasation of blood from the vessels into the intestinal walls. The latter grow turgescent, become thickened to twice or more their normal thickness, and are firm to the touch. The blood, originally only serum, transudes in great quantities through the mucosa into the lumen of the intestine, gradually liquefying the contents.

A few seconds, at the most a few minutes, after strangulation there occurs a string-of-pearls-like contraction in the strangulated loop. This recedes in a few minutes, and from that moment on gradual paralysis continues synchronously with the increase of the venous stasis. Development of gases occurs in the intestinal loop. It becomes distended and tense. Its circumference is almost doubled, and in some cases tripled and more, due to development of gas, transudation of serum into the intestinal lumen, and thickening of the walls. All of the above-mentioned symptoms are fully developed within four to eight hours after strangulation. Development of gas occurs in the strangulated loop and becomes intense even when the loop at the time of strangulation contains but little fecal matter, or when as much of it as possible has been removed. Thromboses occur within the first few hours after strangulation. The walls of the loop become inflamed. In the course of time circulation is entirely stopped, and gangrene of the loop follows.

The afferent and efferent loops next to the strangulated portion of intestine, contract spasmodically a few minutes after strangulation has occurred. They are found in this contracted condition, unchanged in any other way, when the strangulated portion has already undergone the changes above described. The loop immediately above the strangulation begins gradually to become distended with gas. The lower one remains more or less contracted till death. In cases in which strangulation had existed for forty-eight hours the distention in the loop above the strangulation was by no means as great as it was in the strangulated portion within eight hours after strangulation had been produced. Where strangulation had existed for more than two days the loop above was found dilated only in its lower portion. The contractility of the distended intestine above the strangulation was reduced to some extent, but the impairment of the musculature was very slight, as irritation by pinching the gut with forceps was always followed by firm contractions.

Peritonitis existing at the time of strangulation or occurring synchronously seems to inhibit to a marked extent the development of local meteorism of the strangulated gut, but, on the other hand, to further general meteorism.

In the second series of the first group, strangulation was complete, and the gut immediately assumed a pale and cyanotic hue. Finally it became dark ashy-gray to greenish. No transudation into the lumen or into the peritoneal cavity occurs. In the loop of intestine one may find only slight quantities of fluid and rarely bloody contents. The peritoneal cavity contains large quantities of fluid only in the cases in which general peritonitis has set in. The gases distend the incarcerated portion of the gut, the walls become tense. and the circumference is increased. All this is quite

marked, but not as much so as in the first series of cases. Degeneration and perforation of the intestinal wall occur. Paralysis of the musculature occurs also and more rapidly than in moderate strangulation. At the beginning of complete strangulation spasmodic string-of-pearls-like contractions are more intense than in cases of moderate strangulation but of shorter duration. The loop of intestine above and below the strangulation differed from the same segments in moderate strangulation only in that the contractions set in earlier, were more intense and spasmodic, and lasted longer.

Results of the second group in which an intestinal loop has been completely stenosed at two points without impairment of the circulation.—In these cases practically no gas-production occurred. In double stenosis of an intestinal loop containing fecal matter gas develops, it is true, but in such a small amount that it could not be designated as distention. The contractility of the stenosed gut is but slightly affected, if at all, at the end of forty-eight hours. The circulation does not incur any notable changes. The loop of intestine above the upper stenosis becomes slightly and uniformly distended. This distention is always greater than that of the stenosed, empty, or filled loop. The circumference of the upper loop does not increase to twice its normal size, nor does it amount to palpable distention. The portion of the gut below the lower stenosis is usually unchanged. It may be slightly contracted. Double stenosis of an intestinal loop did not prove as acutely deleterious to the life of animals as did strangulation, nor was gas produced in nearly so great quantity.

Results of the third group in which circulatory disturbances were produced by ligation of mesenteric vessels without mechanical impairment of the permeability of the intestine.—Simultaneously and parallel with

the increase of the circulatory disturbance, venous hyperemia, there appeared decrease of contractility and finally paralysis; thickening and induration of the walls due to transudation of the blood into the intestinal wall; finally gangrene; transudation of the blood into the intestinal lumen and into the abdominal cavity; gas-formation. In some of these experiments he observed that the transition from unchanged to changed intestine was definitely marked, and this is explained probably by the experiments made by Litten on dogs, which showed that the superior mesenteric artery comports itself like a terminal artery.

Results of the fourth group in which the ileum was ligated or stenosed at one point only and the mesenterium of the portion of the intestine below the stenosis firmly ligated as in the cases of the third group.—It was found that interference with the circulation of an intestinal loop, venous stasis, produced meteorism even though gas and fecal flux from above is cut off, and when the lower exit is open. Gas-production takes place in a section of intestine in which the circulation is considerably impaired, in the absence of larger amounts of fecal masses. Increased quantities of fluids and gas in the lumen, thickening of the wall, loss of contractility, and, in fact, all changes in the intestinal loop in which a disturbance of the circulation has been effected, in the sense of a venous stasis, may be primarily traced to these circulatory disturbances as the main, perhaps only, cause.

Kader found in all cases of strangulation of an intestinal loop that gases formed in a few hours. The etiology of the gas-meteorism is the circulatory change or impairment. The presence of intestinal contents in the loop at the time of strangulation influences the quantity of gas-production, but is not essential for its production. The experiments of Magendie and Gerardin, as well as those of Tuntz, verify the au-

thor's results. According to Magendie and Gerardin there occurs, especially in certain marked, acutely arising cases of meteorism with intestinal occlusion, an exhalation of gases from the blood into the lumen of the intestine.

Tuntz and his pupil, Tacke, assume that in normal conditions from ten to twenty times as much of the intestinal gas is removed through the lungs as per anum. But when there is impairment of the circulation there form in the affected section of gut gases from putrefaction and decomposition products of the intestinal contents, as usual, but they cannot be resorbed or removed rapidly enough. This gives rise to local massing of gases, local gas-meteorism.

A critical review of cases of intestinal occlusion reported in the literature shows that the distended portions of the intestine presented various grades of development of venous stasis, and the lumen of the intestine contained partly bloody fecal fluid and partly gas. If it is assumed that without strangulation of the mesenteric vessels there can be no circulatory disturbances it would carry one far afield. Kocher showed almost thirty years ago, in an article on strangulated hernia, that the circulation in the intestinal wall could be affected by mere distention of the gut without direct involvement and impairment of the vessels of the mesentery, and has shown in experiments on dogs that ligation of a section of intestine above and below and injection of fluids or air produce a marked venous stasis in the section of gut involved, while the mesentery is in no way affected.

Schmidt states that it is by no means necessary that in abnormal collections of gases in the intestines there must aways exist a pathologic increase of intestinal fermentations. If it is present, it is usually not the cause but the results of the stasis. He further asserts that impaired function of the intestinal musculature,

or stagnation of the contents from other causes, is the most important and the most common cause of abnormal intestinal gas-production. It may be said of the intestine as of the stomach, that pathologic gas-formation without disturbance of muscular activity is exceptional.

In paretic conditions the intestine becomes distended, and this leads to diminished expulsion of gas, as by the distention the resorption into the blood-vessels is interfered with and the contractility of the intestinal muculature is impaired. There occurs, as Nothnagel puts it, a vicious circle, whose primary cause must be sought in muscular weakness.

The apparently contradictory conclusions of different experimenters need not be so confusing if we pin our faith to one primary cause of intestinal meteorism, —a failure in resorption of the intestinal gases by the blood, plus a failure of the gas being carried along the intestinal lumen by active peristalsis. This may be brought about by a circulatory disturbance in the mesenteric artery or its branches, or by an occlusion, followed by primary distention and a circulatory disturbance of the vessels of the intestinal wall.

Ortner describes a case of arteriosclerosis of the intestinal vessels, especially of the superior mesenteric artery, in which tympany and pain occurred regularly two or three hours after meals. He attributes this directly to spasm of the intestinal vessels, occurring when the functional requirement of the intestine was increased, causing, because of the diseased condition of the arteries, temporary arrest of the circulation in the vessel-area involved, resulting in decrease or failure in gas-resorption.

This same point was recently brought out by Dr. H. L. Aiken in a paper read before the Omaha-Douglas County Medical Society, in which a case was reported with similar symptoms and like conclusions. In

the discussion Drs. Bridges and Dunn reported cases of a similar nature.

It is probable that the increased meteorism found in cases of gastroptosis and enteroptosis, is due, not only to lessened peristaltic power because of a lowered muscular tonus, but to a failure in normal resorption of gases due to diminished circulatory activity because of the elongated mesentery.

The effect of exposure of the abdominal viscera to air, sudden cooling, rough handling, etc., though of great importance in all abdominal work, has seldom been the object of exact experimental research. The crucible of practical experience, the final court of appeal in any surgical question, has been the chief factor in the elucidation of knowledge bearing on this subject. The work of Cannon and Murphy is of so much interest that it cannot be omitted here. These workers performed experimental sections on cats, first seeking to learn the immediate effect on the movements of the stomach. They fed the cat through a stomach tube 25 c.c. of mashed potatoes in which had been mixed 5 grams of subnitrate of bismuth, in order to ascertain, by means of the fluoroscope, the rapidity with which the food passed out of the stomach and along the intestine. The usual operation was resection of the intestine with end-to-end suture. It was found that in the control-animal one-half hour after the food was administered quite a quantity had already passed the pyloric orifice. In the animal that had undergone intestinal resection 18 cm. below the pylorus not any had passed from the stomach at the end of five hours. At the end of six hours some had passed, but not as much as during the first hour after feeding the control-animal. This demonstrates complete cessation of peristalsis of the intestines for five hours after resection. During these five hours gastric peristalsis seemed normal, but the pyloric sphincter was tightly closed.

The experimenters draw from this a striking lesson on the conservatism of nature. It takes about five or six hours for a gluey exudate to form and to render efficient support to the newly united intestine. "It is certainly very striking that the period of primary repair and the period during which the food is prevented from entering the injured intestine should so closely coincide." (Cannon & Murphy.)

They also found that when the intestinal suture was made near the ileocecal valve the food began to leave the stomach in two hours, but it accumulated in the upper segment of the small intestine above the point of suture, and none of it entered the large intestine until after seven hours. From this they make the following inference: "It may be that at any point along the alimentary canal injury produces a functional blocking effect which saves the injured part from activity until a certain degree of repair has taken place."

Cannon and Murphy also made experiments on post-operative ileus, an effort being made to find out what factors were most hostile to post-operative intestinal peristalsis. They sought light on the following points: (1) the effect of etherization; (2) the effect of exposure to the air; (3) the effect of cooling; (4) the effect of handling.

(1). *The effect of etherization.*—Etherization was found not to stop the movement of food, but to make its progress from the stomach and along the intestine slower than normal. Normally, food was found to reach the large intestine in two to three hours, while in the etherized animal it took four, five, and six hours to pass the same distance.

(2). *The effect of exposure to the air.*—Under ether a long median abdominal incision was made, the borders of the cut being widely retracted, in order to permit the air to come freely into contact with the

stomach and small intestines, care being taken not to touch the viscera. As soon as the serosa became dry and lost its glisten the abdomen was closed. The emptying of the stomach was not much delayed—not so much as after simple etherization, but the food did not reach the large intestine till six hours after it was administered.

(3). *The effect of cooling.*—An incision was made, and, in order to cool the serosa without drying it, normal salt solution at a temperature of 20° C. was injected at intervals. The stomach emptied itself only slightly less quickly than normally, and the food reached the large intestine in three hours.

(4). *The effect of handling.*—Four methods of handling were made use of: (a) gently, under normal salt solution; (b) gently, in the peritoneal cavity; (c) gently, in air; (d) severely, in air.

Under the first three conditions no food left the stomach till the end of three hours, and the progress along the small intestine was very slow. In only one case did the food reach the large intestine in seven hours. Gentle handling in air produced the greatest amount of slowing, in one case not all of the food having reached the large intestine in twenty-six hours, while in the control-animal this was accomplished in five hours. Thus even gentle manipulation of the stomach and intestines seems to be a more important factor in the production of post-operative intestinal inactivity than etherization alone, exposure to air alone, or cooling alone.

I have found in my clinical work that post-operative tympany and trouble in securing intestinal evacuations, have decreased in proportion to the care used in keeping the operating-room warm and the exposed coils of intestines protected by pads wrung out of hot normal salt solution. Even the slighter abdominal sections done with equal care in handling, but in a cool

operating-room and without the protection of hot pads, have been followed by a stormy period of tympany and other disagreeable symptoms which accompany this condition.

What to do when much tympany is present before the operation is a matter of a great deal of importance. Can ante-operative treatment decrease the tendency to post-operative tympany? It has been shown in the experiments quoted that one of the factors in gas-formation is fermentation of the food residue. To obviate trouble from this cause the use of laxatives before operations is wise but liable to be overdone. A very brisk cathartic, acting violently, not only clears out the contents of the intestine, but exhausts the contractility of its muscular coat. To how great a degree this is true and how long the exhaustion of violent peristalsis lasts, I do not know, but it has been a matter of frequent observation that a lessened peristalsis follows a too brisk catharsis.

Post-operative treatment should be as simple and natural as possible. There should be no starvation, unless the stomach or small intestine is in a condition to prohibit food, but no forced feeding at first. The weakness which follows denial of all food, and the discomfort and disgust of too much should alike be avoided.

Water given as soon as the patient calls for it has been found greatly to promote comfort and a feeling of well-being. It also seems to encourage post-operative peristalsis. This need for water is natural, and its prohibition seems now to have been the refinement of cruelty. The tissues are dry from the preliminary laxatives and loss of blood. Water serves, not only to quench the thirst, but to dilute the anesthetic, which collects in the stomach, and its early use is humane, as well as beneficial.

Something to promote early restoration of peristalsis

is of great importance if a case would pass a comfortable convalescence. For fourteen years I have made a routine use of strychnia, hypodermatically, after operations, not so much as a heart-stimulant as to encourage peristalsis. When it was first made use of it was a matter of frequent remark in the hospital that trouble from post-operative tympany was of rare occurrence.

Of late, cases that give trouble from unusual accumulation of gas have been treated with hypodermics of salicylate of eserine, in doses of 1-60 to 1-40 gr. Its use has been followed often by an early passing of gas, and there can be no doubt that it promotes peristalsis to a remarkable degree and is of great use when the tympany is due solely to muscular atony. Vogel claims also that it prevents intestinal adhesions. An absolute contra-indication to the use of eserine is mechanical obstruction, and it should be avoided just the same as one avoids cathartics when mechanical obstruction is present. When rightly used eserine is an important advance in the treatment of atonic tympany.

The points that practical surgeons need especially to have in mind are:

1. To have as little fermentable substance as possible in the intestines before operation.

2. To do as little as possible during the operation which will interfere with the normal circulation in the intestinal wall. This can probably best be prevented by a minimum amount of handling and resulting trauma.

3. To leave the intestines in the best condition for active peristalsis. Long exposure and much cooling are inimical to active peristalsis.

DISCUSSION OF THE THREE PRECEDING PAPERS

Dr. R. C. Coffey (Portland, Oregon): To begin with Dr. Benjamin's paper, I have been very much interested in it

and the illustrations. I regret, however, I did not hear all of his paper.

This question of dilatation and prolapse of the stomach is one which is very debatable, like religion. In religious matters there are those who absolutely scoff at everything and who believe in pure materialism, while, on the other hand, there are those who are entirely spiritually inclined and who do not believe in materialism. Now, the same thing holds good with regard to cases of prolapse of the stomach. There are able men who practically consider it a non-surgical condition under all circumstances. Again, there are able men who believe that it is surgical under practically all conditions. Then there are those who believe that it is almost an entirely psychological condition. It seems to me, from the experience I have had in this matter, there is a happy medium in this.

There is a certain class of these cases in which there is produced a mechanical condition and obstruction with symptoms such as gastric ulcer produces, but those conditions are comparatively rare. I venture to say that not more than one in five cases of prolapse of the stomach coming to the surgeon for relief is a strictly surgical case. Probably not more than one in twenty-five cases coming to the internist and neurologist for treatment is surgical, but the fact remains that certain of them do have surgical features, and the results of surgical treatment are practically as good as those obtained from operating on gastric ulcer. In a series of last year's work of twenty-nine stomach operations, fourteen were for cancer; ten for gastric ulcer, obstructive; four for prolapse of the stomach; and one for perigastric adhesions. The operation for selected cases of prolapse of the stomach, which produces symptoms similar to stomach ulcer, is followed by as good results as in cases of ulcer. There are certain conditions of prolapse that are purely mechanical, and are just as surgical as any other condition within the abdomen.

I am interested in Dr. Benjamin's conclusions on this subject. I believe that the results he has described are good. So far as the Beyea operation is concerned in these extreme cases, I have found that the lesser omentum is not sufficient to do the work. I have therefore in most instances done the hammock operation. This operation of suturing the omentum to the abdominal wall produces a firmer and stronger support, and yet the combined operation will produce more nearly an ideal result theoretically. The results, when the

cases are properly selected, from such operations are as good as in other surgical abdominal cases. But the man who attempts to do surgery on all these prolapsed conditions indiscriminately is dangerous and will do more harm than good, just as was the case when everybody did gastro-enterostomy for the relief of symptoms of ulcer, but in some of which cases they were unable to demonstrate ulcer at the time of the operation.

Dr. Daniel N. Eisendrath (Chicago): I do not believe there is a subject which we can more profitably discuss than the one brought out in the paper of Dr. Fairchild, and that is post-operative acute dilatation of the stomach. Those of us who have had experience with this complication feel that it is one which, without early diagnosis and prompt and persistent treatment, will prove a failure. It comes upon the patient like lightning out of a clear sky. There are several features in regard to this subject of which I do not believe surgeons in general have a clear enough comprehension. During the past few years, at the Michael Reese Hospital, Chicago, we have paid special attention to these acute cases of dilatation of the stomach, in order to determine the cause in some of them. We have found in quite a large proportion of instances that the direct cause of the acute dilatation, or causes, are repeated capillary hemorrhages into the stomach. We have substantiated this by examinations of the washed contents and by other tests, showing that the hyperacid contents consisted largely of blood. How does this hematemesis take place? There is not a hematemesis in the sense that we get it from a gastric ulcer or from gall-stone complications. It is a fine capillary type of hemorrhage, which keeps up hour after hour, which irritates the stomach, and sets up a pyloric spasm and brings on dilatation.

During the month of August I operated upon a man who had, in addition to an appendicitis, an acute gangrenous cholecystitis complicating gall-stones. Everything went smoothly for thirty-six hours. He was very happy, was sitting up in bed, and passed some flatus, so that we felt there was no indication of peritonitis. But suddenly he began to vomit this typical coffee-ground material in pint quantities. At the time he showed a rapid pulse with extreme prostration. In washing out the stomach we found this typical coffee-ground vomit which, on analysis, was blood. We made the diagnosis from a physical examination of the abdomen. The question arose, Is it a case of post-operative intestinal

obstruction due to septic peritonitis, or one of acute dilatation? We differentiated in this way: In the first place, examination of two-thirds of the abdomen showed that the abdominal wall was quite soft; the patient had passed some flatus; the upper half of the abdomen showed, as it does in all these cases, an enormous dilatation, which is quite characteristic, if we look for it in the presence of a moderate degree of peritonitis. Here was a displaced appendix. All the symptoms pointed to an acute dilatation of the stomach as differentiated from post-operative ileus. We washed out the stomach immediately, and everything went smoothly for two or three hours. We are never through with these cases after first washing out the stomach. In the great majority of cases, after four hours, we have repeated the washing, as we did in this case, with finally a favorable outcome. One washing is not sufficient to take care of these cases of acute dilatation of the stomach. We put in a large quantity of bicarbonate of soda to neutralize the hyperacid contents. How shall we treat those cases in which the hematemesis continues hour after hour in spite of everything that is done unless we wash out the stomach plus the use of stypticin? In a large number of cases of acute dilatation of the stomach we have been using stypticin in grain doses, every four hours, given hypodermatically, and this has helped us in stopping the hematemesis.

Acute dilatation of the stomach is a condition that is very apt to be overlooked. We have gone along for weeks and months and have not looked for it.

There is one point I wish to mention, and that is in regard to allowing nurses to use their own discretion in giving quantities of water to patients who have had either a septic appendix or a septic gall-bladder. Undoubtedly, cases of acute dilatation of the stomach have been brought on by the use of consideratble quantities of water. I distinctly remember giving five or six ounces of water to one patient every hour or two. The stomach is not able to care for this amount of water, a pyloric spasm is set up, and we have the same clinical picture.

Dr. Charles H. Mayo (Rochester, Minn.): These papers open up a large field for discussion. I agree with Dr. Coffey, who, in referring to Dr. Benjamin's paper, said that if the internist picks out one case in twenty-five of what he considers dilatation and prolapse of the stomach, and sends them to a surgeon, the surgeon would probably not operate on one in five.

There can be no question but what patients get symptoms indicative of great discomfort from prolapse of the stomach. If we are going to do an operation like the infolding of the stomach because there is dilatation, if we do not have signs of trouble from the dilatation by obstruction, then the question arises as to what to do. The heart may give out and compensation take place, and so the stomach, when large and abe to do its work, will empty itself; such is not a surgical condition.

If you can find that the pylorus is open, and there is no kinking of it, there may not be any occasion for operation. We have done gastro-enterostomies in those cases in which there has been a kink of the pylorus. But where you have a big stomach to deal with, I do not believe it is advisable to drain unless you really have signs of obstruction by the retention of food. If the stomach is dilated, is compensated for, and still able to do its work, then you should look for the condition that may be behind it. This may be a chronic congestion of some of the vessels, as has been brought out. I have infolded the stomach and have re-operated in eleven months thereafter, and have found that all the sutures had given way, but there was a scar at each suture point. I had not gotten at the condition. I have found that the big stretched-out sac, even in health, could not stand the pressure of the gases and food. At the second operation I have found a diseased appendix as the cause of the pyloric spasm, which accounted for the dilatation.

We may find gall-stones in these cases as the cause of the trouble, as in one case reported, finding something acting as a reflex on the pylorus, producing this condition on top of an old chronic dilatation. If you make another outlet, be sure one is shut up. This is exactly Peterson's operation, who taught us how to prevent prolapse of the rectum. Infolding the rectum to prevent the peristaltic wave, making two rows of sutures, may prevent this peristalsis of the stomach and prevent its emptying itself.

With reference to Dr. Fairchild's paper: Acute dilatation of the stomach is a quite common condition, but naturally the cases we hear about are those in which death has occurred. We see it all the time. It is a bad condition, and if they do not die they suffer great distress and discomfort. This condition generally comes on about four days after operation, and we should wash out the stomach every four hours, until relieved, but we should not wait until the symptoms come on. Some people die of acute dilatation of the stomach, without

a great deal having been done for the condition. We have done gastro-enterostomy in these cases, and a foul, blackish fluid has passed through the gastro-enterostomy opening into the intestines, and some of these patients die very much like cases with strychnine poisoning. An effort should be made to get the stomach empty, and one should not wait for the acute symptoms to come on before doing something. We should not look on this as a fatal condition except in the unrecognized cases.

Dr. Jabez N. Jackson (Kansas City, Mo.): I would like to make a few remarks on the subject of so-called acute gastric dilatation, a condition with which, I believe, oftentimes is associated intestinal paresis as well as gastric paresis. Some years ago I had an unfortunate experience in two cases, the termination being fatal in each instance. In trying to arrive at a possible explanation of the cause I was struck with certain factors. In each instance I had a patient who belonged to that class of people in whom there was marked disturbance of metabolism previous to operation, as evidenced by a change in the color of the skin, flabbiness of the complexion, and general laxity of the tissues. These patients consumed an unusual amount of the anesthetic agent in order to accomplish anesthesia—in fact, much more than is ordinarily the case. Therefore, I have come to believe that, after all the primary cause in most cases is a disturbance of metabolism, which is increased probably as a result of the toxic influence due to the excess of anesthetic used. In our experience also we believe that chloroform disturbs metabolism more than ether. In recent years, since we have adopted exclusively the open method of administering ether and in minor quantities, this trouble has disappeared, and while we have occasionally seen the early signs and symptoms of a beginning acute dilatation, yet apparently they have not been attended with the fatal results which were previously expected. Since reading the discussions that have been made in the last few years relative to tension of the mesenteric vessels on the duodenum as a possible cause, I have followed out the routine in all cases, that where a patient shows signs of gas-irritation of the intestine, I turn him over on the abdomen and elevate the foot of the bed, and I have been surprised at the good results that have followed that course. I also supplement this postural method with early and frequent use of gastric lavage, and in the last two or three years I have had several cases which have promptly recovered from conditions that

were thoroughly alarming. When a patient develops tympanitic distention of the intestine, with traction on the mesentery and mesenteric vessels, more tension is put on the duodenum, and therefore we have an exaggeration of the obstructive symptoms, so far as the stomach is concerned. If we cannot empty the stomach at the stage of its gaseous distension, we should turn him over on his abdomen, elevate the foot of the bed, and by so doing we will apparently get good results, not forgetting to resort to gastric lavage. We must remember that every patient who requires a considerable amount of the anesthetic, more than the usual patient receives, should have the stomach washed out immediately as a routine method. I believe we would have a less number of cases of post-operative acute dilatation if every stomach were washed out immediately after the anesthetic was concluded, as some surgeons have advocated.

Dr. J. W. Andrews (Mankato, Minn.): These papers and these discussions have been exceedingly interesting to me, and bring to my mind one case, that of a woman, past middle age, with a malignant kidney of sufficient size that it bulged forward to a considerable extent, and which I removed through the peritoneal cavity. The patient did well for about ten days, after which acute dilatation of the stomach came on. She began to vomit coffee-ground material, and I could not imagine why she was having so much trouble with the stomach. In a short time the patient died. A post-mortem examination was made and disclosed the largest dilated stomach I have ever seen. It was so enormously dilated that it reached down to the brim of the pelvis.

I cannot refrain from saying a few words on another phase, but one which has a bearing on this subject. In our city (Mankato) during the past year we have had a severe epidemic of typhoid fever, and among the cases there were several instances of acute dilatation of the stomach. The stomach was enormously distended, but the intestines were no more distended than is usually the case in typhoid fever; yet every one of those patients died from acute dilatation of the stomach. What the cause of death was, I do not know. Whether it was the result of the capillary hemorrhages that have been mentioned or not, I cannot say. It is, however, an extremely fatal condition.

The President: Did you wash out the stomach?

Dr. Andrews: Not in the typhoid cases.

Dr. M. L. Harris (Chicago): I have come to classify cases of chronic dilatation of the stomach under two heads: first, those in which there is mechanical obstruction, and surgical interference is the proper treatment; second, those in which there is no mechanical obstruction. It is doubtful in my mind whether the latter cases are benefited by operative measures. I have never seen any reason for the plication of a dilated stomach. If the stomach is dilated as the result of mechanical obstruction, plication is certainly useless. If it is dilated, not from mechanical obstruction, but from atony or from any other condition, plication will interfere with what we want to increase, that is, vermicular action. Plication, or infolding of the stomach, must necessarily interfere with peristalsis, because it does so in every other part of the intestinal tract where we resort to that measure, and so I have never seen the rationale of plication of the stomach.

You all remember the demonstrations that were made by Dr. Codman two or three years ago relative to the influence of the root of the mesentery, producing dilatation of the duodenum. He assigned that as a material factor in the causation of post-operative dilatation of the stomach and duodenum. This summer, during a visit to Boston, I saw one of these cases with Dr. Porter. I was making the rounds with him in the Massachusetts General Hospital when he called my attention to a case that had been operated on two or three days before by Dr. Codman, and Drs. Codman and Porter demonstrated most beautifully a dilated loop of the upper duodenum, and I must say it was one of the prettiest demonstrations I ever saw. This patient had had the stomach washed out,—I do not know how many times,—but it had been washed out a number of times before Dr. Porter saw the case. After the patient was turned over on the abdomen, and the pelvis elevated, it was remarkable to see the great improvement which took place. There was rapid recovery. I think this position of the abdomen is infinitely better than the exaggerated Trendelenburg position. It is a much more comfortable position for the patient, and, this being a mechanical condition, it is certainly the best position to relieve the duodenum of the pressure of the mesentery which may be one cause of acute dilatation, and each cause should be considered.

Dr. Henry T. Byford (Chicago): It has been said that we should not plicate the stomach. If we plicate the normal intestine, it will interfere with its function, and the same holds true with regard to the stomach. A dilated stomach

is different from the normal stomach. But we have a stomach which cannot contract. We have a pouch which hangs down, and we cannot diminish its contractile power, because it hasn't any. By relieving the pouched condition and helping drainage through the duodenum, we are establishing temporarily postural treatment, and, as the essayist has said, giving the stomach a chance to empty itself. And as probably the adhesions will stretch after a while, we have not permanently injured the stomach; we have not injured motility, which does not exist.

DR. A. M. POND (Dubuque, Iowa): Two years ago I had the pleasure of reading a paper on this subject, reporting at that time my experience with four gastroplications, and at the time I read the paper I was much pleased with the results, but said that we could rely only on the ultimate results. The cases I reported then dated from June, 1904, to December, 1904. The immediate relief was as prompt and as satisfactory as we get in cases of obstruction in which we do gastro-enterostomy. In washing out the stomach and determining the capacity of it, I found it was about the same capacity as before I operated. I again operated and found that the plication had not given way, but there was an immense stretching of the posterior part of the stomach. I attempted to brace the anterior part of the stomach while the posterior was still sagging. I did no operation, but about that time Dr. A. Rose, of New York, advocated a suspensory belt to afford artificial support, and immediately after the second operation I applied the Rose belt, and the patient has had a good result from it since.

DR. BENJAMIN (closing the discussion on his part): I am very much obliged for the discussion on my paper, but there are two or three points I want to especially emphasize. First, this question should be carefully studied. I think the literature will bear me out in the statement that in many of the acute cases the dilatation of the stomach has back of it a preëxisting chronic condition—obstruction, dilatation, or prolapse of the organ. The acute condition may come on more rapidly where there is any obstruction of the vessels from the dragging and sagging of the stomach, and the pouring out of fluid into the stomach as the result of interference with the circulation.

I think it is very essential for us to consider the postoperative care of these cases, and not to turn them loose after they have been operated on, and say, "Now, you are

well. The operation is all you required." We must follow up these cases. We should instruct them with regard to the strengthening of the abdominal muscles by exercise to give them force enough to maintain the organs in the normal position. We should put them in the knee-chest position and have them assume that position a number of times a day, and by taking the necessary hygienic care in addition, good results will be achieved.

I am sure both Dr. Mayo and Dr. Coffey have stated about correctly the percentage of cases we would operate on. I think in my paper I mentioned that very few of these cases need to be operated on, but when they do require operation, the indications are strong and imperative, and the results have been so satisfactory in the cases on whom I have operated that I shall certainly continue to operate on certain cases, *e. g.*, cases in which there is a mechanical obstruction, and shall suspend the stomach if greatly prolapsed. If we shorten temporarily the gastrohepatic omentum so as to allow the mucous membrane to return to a healthy condition, educate the patient to sustain and maintain the organs in a normal position, regulate the diet, and after that put on a straight front corset or supportive bandage, we shall secure goods results. I am sure the contractility of the plicated stomach is not especially interfered with. If you cut off part of a muscle or half of a muscle, the rest will contract just the same. If you resect a portion of the bowel, the rest of the bowel will contract just the same. What difference does it make to interfere with the muscle fibers if it is a temporary suspension, as has been stated? It allows the stomach to drain and the muscle-tone to improve, at any rate.

Dr. Fairchild (closing the discussion on his part): I am very glad, indeed, to have heard the useful information which has been offered in regard to the treatment of acutely dilated stomachs, and I almost feel as if this accident should not happen again if we follow the suggestion of Dr. Mayo, yet, I think, we have washed out stomachs of patients that were dilated with gas and contained undesirable contents. This is the experience we have been through.

Once in a while the stomach will undergo some change which is included in the observations made by Dr. Mayo, but it will be found that the observation made by Dr. Eisendrath can be borne out by most of us. But just what the condition is that leads to the hemorrhage from the stomach, I am sorry Dr. Eisendrath did not tell us, and it may be he does not

know. While a dilated stomach is a common occurrence after operations, we have once in a while a case in which, on account of some toxic influence, paralysis of the stomach occurs, or there is a spasm of the pylorus that is followed by most disastrous results.

I was very glad to hear what was said by Dr. Harris and Dr. Jackson, because the exaggerated Trendelenburg position has been the one advocated for these cases of gastromesenteric ileus, and this suggestion seems to be just as good, or better, in that it leads us to the same results.

In regard to the danger of plicating the stomach: I am prompted to say a word or two on that phase of the subject. At the outset, I must acknowledge that I have never done this operation; I have never seen a case where I thought it was demanded in dilatation of the stomach non-mechanical in character.

DR. EISENDRATH: I would like to say this, in addition to what I have already said with regard to hematemesis, that these cases are undoubtedly toxic in origin.

DR. DAVIS (closing the discussion): I have nothing further to say with regard to my own paper because it has not been discussed, except to offer this explanation of the character of the paper I brought before you: I took the trouble to have an expert at the library of the Surgeon-General's office look up the literature on that subject and send me extracts from it; so that the paper I have presented is a résumé of practically all there is in the literature on the subject of intestinal gases from the standpoint of surgery.

I would like to say a word or two on the subject of Dr. Fairchild's paper, namely, dilatation of the stomach. So far as post-operative dilatation of the stomach is concerned, I feel the whole thing centers almost entirely on prophylaxis. I have found in cases where there is dilatation of the stomach that the very early and frequent use of the stomach-tube, and especially washing out the stomach, after it has been evacuated, with hot water, will do more to bring about a normal condition of things than anything I have ever seen tried. I have had two cases of severe post-operative dilatation of the stomach, one of which recovered and the other died; and in spite of all we can do in the way of washing out the stomach they die. They do not seem to improve.

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THE VALUE OF ENTEROSTOMY IN INTESTINAL OBSTRUCTION

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All of the phases of this subject have been so fully discussed by those large in experience and pre-eminent in wisdom, and so considerable a number have added to our common knowledge by contributions from their experience in the use of this measure, that it is with some fear of presumption that your essayist ventures to add aught to this moot subject.

Those surgeons who are called upon to travel considerable distances to reach cases of intestinal obstruction, or who have cases brought to them from afar, or, where the usual too much time has elapsed, ever feel the weight of oppression and almost apathy arising from their experiences in intestinal obstruction. The mortality is hard to estimate, and is so shockingly high as to cause those doing surgery in the less populous centres to feel that theirs is an unfortunate and rather helpless and hopeless state. But those in some of our greatest cities where hospitals are everywhere at hand, would seem to be scarcely more favored than we, to meet the emergency. According to Elsberg, "the mortality from intestinal obstruction after operation has been variously estimated at from 50 per cent to 70 per cent." "Of 100 cases treated by operation in three large hospitals in New

York City during 1906, 54 died." "Ranzi collected 758 cases of literature, with a mortality of 57 per cent. Other reports give a still higher death-rate." The same author states that in only about 10 per cent to 15 per cent of the cases admitted into Mt. Sinai Hospital is the patient's condition still to be called a good one."

It is therefore our common experience that cases of intestinal obstruction are seen too late to be operated on without a high mortality. The more extreme the conditions the more surgery, the more time, and the more anesthetic necessitated to meet the requirements of complete mechanical and functional relief. These factors, except that of anesthesia, have been recognized by surgeons for more than a hundred years. The baneful influence of anesthesia in those already toxic, has long been recognized, hence the efforts to minimize its use or to escape it altogether. Local anesthesia therefore is preferred by those who fully recognize its uses and value in the cases whose emunctories are already overwhelmed, and those in whom only the most tentative intervention will be tolerated. The tendency to limit the anesthetic, time of operation, and amount of intervention, and at the same time bring the immediate relief so urgent, to relieve the intestinal canal of its fatally toxic contents, has grown to such extent as to be recognized as the practice to follow. Guided by these principles, radical or complete operations must be eschewed in a still larger proportion of our cases. The drainage of the intestines loaded with deadly toxic material should be accomplished by the simplest, shortest, safest, and best means at our command. These requirements are most often met by enterostomy according to the E. J. Senn or Kader technics. Obviously, this particular technic has been used by but few, and the origin of its application as applied to enterostomy uncertain. Its advantages, however, should be grasped by all, for by it

many of the disadvantages of old-time enterotomy, and of enterostomy in its diverse forms, are obviated. Notwithstanding the fact that Mr. Treves credits enterostomy with a large share in his success in his treatment of intestinal obstruction, yet he prejudices his readers by alluding to it as a "rough and ready operation." But finally he says, above all the arguments remains the fact that this undoubtedly uncouth measure has been the means of saving life.

According to Nicholas Senn enterostomy was recommended by Louis in 1757, and first successfully performed by Renault in 1787. Nelaton revived the operation in 1840. So strong was his impress of the importance of this procedure that the operation still bears his name. Practically all surgeons have recognized its value. Done in the original way, however, too many objections have clung to it, to favor as frequent resort to it as its value justifies.

Enterostomy done after the method of an Emanuel Senn, the chief objections to the operation are eliminated, the danger of the peritoneal soiling minimized, skin excoriation prevented, and both inanition and secondary operation for closure avoided. The catheter may be removed and reinserted at will, and even though the opening happens to be made high in the bowel no fistula remains to cause inanition. Secondary operations for closure are rarely necessary. The ease, facility, and dispatch with which it may be done in the modern way (under local anesthesia), favors its performance in both those in extremis and those not yet apparently in a dangerous condition; and, hence, in the latter class relief is forthcoming before toxemia and mechanical distension have made recovery impossible.

The writer is not urging this measure in all cases. A few are seen sufficiently early to allow of the necessary search and the required measures to afford complete and permanent relief. But the facts are that

from 50 to 80 per cent of all cases of intestinal obstruction, among surgeons the world over, result fatally. (Elsberg.) With the seeming improved results from this "tide-over" procedure we are becoming more impressed with the folly of radical intervention, except in a relatively limited number.

It is not the purpose of the writer, however, to exhaustively discuss the merits of enterostomy. Its advantages and disadvantages have been fully established in our literature by those of established authority. To rediscuss all of the phases of this subject would be presuming not only upon the time, but upon the intelligence, of this body. But that the advantages of enterostomy, by the method of Senn, Kader, or Gibson, should be better understood and more often and more early applied because its old-time uncouthness and chief objectionable features have been removed, is the special plea from your essayist. The value of the method has been established in the practice of many besides himself; and its value *should be* so fully recognized by all as to make it a factor in reducing the present appalling mortality from the toxemia, resulting from a blocked alimentary canal. Robbed of its hitherto formidable surgical aspects there should be less reason for general practitioners to allow their patients to reach the danger line, extremis, or die for lack of a procedure which they might do if its indications and necessities were more fully impressed upon them. The coming generation of practitioners can be trusted to help our mortality-rate. Surgery is no longer confined to our cities. Acute abdominal crises will receive more intelligent treatment than formerly by the cross-roads doctor. The man who can manage complicated cases of labor successfully will in the future meet other emergencies also. The hospital training so common among a large number of our present-day graduates, is going to have a large influence in bringing to every community men with the ability to

diagnose and the skill to relieve the majority of acute surgical emergencies. Hence the mortality of intestinal obstruction is to be lowered in the near future, and modern enterostomy, for both early and late drainage of the bowel, is destined to be a greater factor in this result.

CASE 1.—J. A., age 38, was operated on eight years previously for suppurative appendicitis. Acute intestinal obstruction had occurred, on the eleventh day, for which laparotomy was promptly done and an angulated ileum freed. Recovery followed. On March 12, 1908, at St. Joseph's Hospital, operation was necessitated for chronic obstruction. Numerous adhesions of the ileum, cecum, and omentum, which were freed from each other, and from the pelvis and bladder; seroplasty and omentoplasty of raw surfaces. Paralytic ileus became well marked on the fifth day. No relief from usual measures. Wound re-opened. No point of obstruction was found. The ileus was apparently due to peritonitis. Enterostomy by Stewart's method with the Murphy button was performed. Slow abatement of symptoms followed. Enterorrhaphy for closure of fistula was done on the third week, with failure. In the seventh week eight inches of the contracted ileum (responsible for failures) were removed united by side-to-side enterorrhaphy, resulted successfully, with complete recovery.

CASE 2.—Mrs. K., age 35, had perforative appendicitis on May 21, 1908. It was followed by diffuse suppurative peritonitis, and the patient seen on the fourth day with Dr. Wearne. She was removed to the Omaha General Hospital, and the gangrenous appendix was removed. Tubage and cigarette drainage and counter drainage were resorted to, the wounds left open. The main incision was in the right rectus. I tamponed with rubber-covered gauze pads to prevent adhesions. Improvement from the desperate condi-

tion was immediate. The drainage was gradually eliminated. Acute obstruction occurred on the ninth day. When seen, six hours after the onset, the patient had sunken eyes and cold sodden skin, with a pulse of 150, and temperature of 96°. Operation was done immediately under morphine-atropine and cocain anesthesia. The angulation of the ileum by adhesions was freed. First presenting loop of ileum entered by the catheter, secured by three tobacco-pouch sutures of catgut, ileum likewise secured to peritoneum. The drainage gave immediate improvement in symptoms, which recurred, however, on the third day when the catheter had been removed for twelve hours and before the cathartic had operated. Temporary reintroduction of catheter gave relief. The convalescence was uninterrupted. The fistula closed immediately after the removal of the catheter. Recovery was complete.

CASE 3.—Patient, age 18, was operated on by Dr. Powell at the Swedish Mission Hospital on May 1, 1908, for suppurative appendicitis. Acute intestinal obstruction followed on twentieth day. Operation was done on the twenty-first day by Dr. Powell, at which the writer was present in consultation. Extreme distention precluded extended manipulation. Relief from operation for separation of adhesions seemed uncertain. Impressed with the value of enterostomy and its applicability in the case, the writer was permitted to introduce a catheter into the ileum by the Senn method. Drainage was free, and the bowel was irrigated with normal salt solution. The symptoms subsided at once, but returned upon the accidental removal of the tube on the second day. Improvement followed its reintroduction. No symptoms followed its final removal on the tenth day. The fistula closed. Recovery was uneventful.

CASE 4.—Mrs. L., age 48, was referred by Dr. Payne of Woodbine, Iowa, and operated on on Sep-

tember 27, 1908, at Clarkson Hospital. On the sixth day after the operation for relief of complicated conditions within the pelvis, following previous operations, with adhesions, by other surgeons, acute intestinal obstruction supervened. A reopening of the abdomen was recommended and refused. After twelve hours of persuasion and resort to the usual measures, not including cathartics, consent to operation was obtained, and the distended cecum was drained by catheter, introduced by the Senn method, after having freed lightly reformed adhesions in the pelvis. Drainage and discharge of gas free, and relief prompt. No movement of the bowels was secured until three days, when normal movements were secured by enemas and normal salt irrigation of the bowel through the catheter. Recovery was uninterrupted and is now complete.

DISCUSSION

DR. WILLIAM D. HAGGARD (Nashville, Tenn.): I have enjoyed the paper of Dr. Lord very much indeed, and I think if we should heed its lesson, it would transfer some of the desperate cases from the dying class into the live class. There is no one here who has not had the mortifying experience of a tremendonsly high mortality attending these hopelessly delayed cases. My own feeling is, if we can operate on these cases quickly under local anesthesia, and give them a quick enterostomy, we shall save a much larger proportion of them primarily.

The essayist mentioned the method of Stewart, of Philadelphia, which, I think, is an admirable one. (Illustrating the Stewart method on the blackboard.) It is simple and ingenious. If you will permit me, I will go into more or less detail. As the loop comes up above the obstruction it is opened in one part, and a Murphy button put in, and a rubber sack is buttoned on to the intestine in that way, so you get an immediate opening, absolutely preventing any soiling of the peritoneum, and you get an immediate discharge of the fecal contents into this bag or sack. With the Witzel or Senn method, the catheter is often too small. In these cases I usually put in a larger tube. There is no doubt about the permanency of the result, as has been brought out by Dr.

John Young Brown, of St. Louis, who has had an extensive experience, in the St. Louis City Hospital, with these cases of obstruction. He has made a plea for simply bringing up the loop of intestine, packing it around with gauze, laying it open freely, and letting it go at that; and the recoveries of his patients were very pleasing.

Dr. J. F. Percy (Galesburg, Ill.): In 1902 I opened the abdomen of the son of a physician, in a case of delayed operation for appendicitis. I did it at the request of the young man, because I considered the case hopeless. I found the condition which is embraced in the title of this paper. This case taught me that there was something necessary besides opening the abdomen for drainage, as we had been taught, before we could hope to cure this class of patients.

My next patient was brought into the hospital about a year later. He was moribund and cyanotic, so much so that I directed my anesthetist to put cold water on the face-mask rather than ether. I made a quick opening in the right iliac region, picked up the first piece of intestine that presented, fastened and opened it. This man remained in a semiconscious condition for three weeks, but made an operative recovery, and some two or three months afterward, when he got tired of his fistula, I resected eighteen inches of gut, and he made a beautiful recovery.

I have had four cases of this kind since 1903, and all recovered. I did this before I knew of Heidenhain's paper, which was presented to the German Surgical Congress in 1902. In looking up this work since, I find that he advocates this method, not only in the last-resort, desperate cases referred to in Dr. Lord's paper, but in all forms of peritonitis, and his mortality records are certainly very gratifying in this class of cases.

I think we owe Dr. Lord a debt of gratitude for bringing to our attention this class of cases and advocating this particular form of treatment. I am sorry, however, that he has mentioned the possibility of doing more for these cases than opening the abdomen and merely fastening the gut to the abdominal wall, because I believe we are tempted then to do more surgery than the patient will stand.

Dr. R. C. Coffey (Portland, Oregon): I think the subject brought out by Dr. Lord is probably the most important that could have been presented before this Association, as there has probably been more advance made in the last year or two in the saving of the lives of these

patients than in any other line of which we know. We can say that our own mortality is at least fifty per cent less than it was two years ago. This lowered mortality is due to two or three factors: First, the family physician now recognizes that an acute distention of the abdomen which cannot be accounted for in any other way, should be looked upon with grave suspicion; secondly, we have learned that a distended paralyzed bowel in which ecchymotic spots develop on the intestine, is dangerous, and it will not empty itself even thought the constriction is relieved.

Acute distention is absolutely different from chronic distention, no matter how great. I remember as a medical student seeing Dr. Holloway, of Louisville, do an operation on the neck. He injected air into the areolar tissues of the neck, in order to prevent hemorrhage. In that way all blood was practically controlled. The same thing takes place in an acute distention of the intestine. The blood-vessels are quickly shut off, and ecchymotic spots and paralyzed areas are soon manifest. If the obstruction comes on gradually, the collateral circulation is established; the distention does no harm to the vitality of the intestine. I remember seeing a case in which a tumor had grown in the superior vena cava and gradually closed it in the space of several months, but the blood was gradually transferred around through the small superficial vessels of the abdomen, and returned through the inferior vena cava.

The next most important point in the lowering of the mortality-rate is not only relieving the distention, if you are on the inside, but of taking out and removing the contents of the bowel. That is probably the most important advance we have made recently. Monks' method, referred to by Dr. Lord, contemplates a little too much surgery in these cases. You can usually, by taking one section at a time, push a knuckle of intestine over the edge of a sterile basin, milk out three or four feet at a time, close it up, and take another section, and in the course of a few minutes have the work done.

Another feature to which I wish to call your attention is, that after you have done what surgery you want to do, it is very important to supply fluids to the body. If you have obstruction low down in the intestine, in which case the intestine has ecchymotic spots to such an extent that the bowel is paralyzed, the secretion is not normal; the

intestine is functionally dead, consequently one of the most important things we can do in these cases is, first, to keep out everything from the stomach, as in the Ochsner treatment for appendicitis, in order to prevent the formation of gas; second, the insertion of fluids from below, as, for instance, Murphy's proctoclysis; third, avoid cathartics. Recently I have had a case in which the large bowel had been so distended by enemata for several days that the patient was unable to retain anything by the rectum. The patient went on for several days and finally died, because we could not get any of the fluids retained in the body. I have in one such case used appendicostomy and dropped fluid into the cecum, drop by drop, by the Murphy method, because it is here in the cecum that absorption takes place. By using the drop method through the appendix even if the sphincter ani is paralyzed, we are able to supply normal fluids.

Dr. F. Gregory Connell (Oshkosh, Wis.): No one will question the advisability of performing enterostomy in late cases. Again, no one will question the inadvisability of performing enterostomy in early cases. After laparotomy and relief of the obstruction, the question arises, When shall we do enterostomy, and when shall we close the abdomen and allow the patient to recover? If we do enterostomy unnecessarily, the mortality-rate will be higher. This point should be emphasized, and I bring it up for the purpose of receiving enlightenment, as I cannot add to the subject myself.

In cases of acute obstruction of the bowel, one point has not been sufficiently emphasized, namely, the danger of general anesthesia, or the advisability of infiltration anesthesia in these cases, because of the danger of the patient drowning with the vomited matter.

Dr. E. Wyllys Andrews, of Chicago, emphasized this years ago, and I have seen two patients die on the table, being drowned by inspiration of the vomited gastric contents. In an effort to prevent this, washing out of the stomach should invariably be performed, immediately before the administration of a general anesthetic. But this is not an absolute prevention, as regurgitation from the bowel into the stomach may occur. By using infiltration or spinal anesthesia, this danger would be obviated. An interesting contrivance has been suggested by Krause, Germany, to prevent this complication. The device con-

sists of a stomach-tube surrounded by a rubber bulb. This is passed into the stomach, and the bulb inflated, which is then made to occlude the cardiac orifice, and any vomiting will then force the contents through the stomach-tube, which is connected with a proper receptacle, in this way doing away with the danger of asphyxiation from the aspiration of gastric contents.

In regard to the method of performing enterostomy: It is a mistake to waste time in doing an operation similar to the Kader or Senn gastrostomy. The drainage should be absolutely free, and accomplished with as little time and manipulative trauma as possible. I have used the Stewart method once with satisfaction; but since then have used the simple Paul or Mixter tube, which is a glass tube bent at an angle, with two ridges at one extremity; the bowel is tied between these ridges, so that it cannot slip either in or out.

I should like to hear more said as to the necessity of Monks' and Moynihan's method of enterostomy, that is, the threading of ten or twelve feet of bowel upon a glass tube, six iches long. Monks and Moynihan claim that this is necessary because of kinks in the paralytic bowel, which allows drainage from only the one segment of the intestine that is opened. Therefore, they have devised and recommended this method of stripping and threading the bowel upon a long tube. I have never had occasion to do this, but should like to hear from someone who has had experience, concerning its necessity, and regarding the amount of shock produced by such manipulation.

Dr. James E. Moore (Minneapolis, Minn.): I think there are two prime indications for this very useful procedure to which Dr. Lord has called our attention. First, in all emergency cases it is indicated. I mean in all cases in which the patients are in extremis, and in the absence of an experienced operator. The absence of an experienced operator has been the cause of many delays and deaths in these cases, even when a diagnosis has been made, because the young man, as has been well said, has his reputation to establish, and therefore has hesitated until perhaps his patient loses his life, whereas many a patient's life might be saved by this simple procedure. It seems to me that is about all we can do in the way of generalizing as to when shall we do this operation and

when not. When shall we do enterostomy, and when shall we do a radical operation? It seems to me we have to depend upon the judgment and experience of the operator who has the case in charge. I think it would be equally objectionable to undertake to do radical operations in all cases as well as to do enterostomy in all cases, because a fecal fistula is a very uncomfortable thing to a patient. It does not enhance the reputation of the surgeon, no matter how helpful it may be, and it necessitates an operation later, which is not free from danger.

At the beginning of surgery for this condition, the mortality-rate from obstruction of the bowels, was stated by Treves to be ninety-five per cent, and yet there are men in every community who will treat these cases today just as they were treated in the days before Treves was born. They will wait and wait and wait, and their mortality-rate is ninety-five per cent, just as it was then. We can reduce this mortality-rate very materially in two ways: first, by operating on these cases early; secondly, by using advanced methods of technic. Along the line of the suggestion made by our worthy President, it is very important to point out when and when not to operate. Gentlemen, if I were the patient, and I had a good, honest, experienced surgeon at my bedside, I should want him to open my abdomen whenever he suspected there was obstruction of the bowel, because I would be morally certain he could perform that operation without endangering my life, and I should be equally certain if he delayed operation and found the next day that I had obstruction of the bowel that I would be in infinitely greater danger of losing my life.

Dr. Frederick A. Dunsmoor (Minneapolis, Minn.): There are two points spoken of by Dr. Moore that I wish to refer to. Dr. Scudder, who collected statistics from the Massachusetts General Hospital, reports that over fifty-five per cent of deaths for the last ten years occurred in cases which had been operated on for all conditions of obstruction, not only acute, but chronic, and of every type. That shows the importance of the subject before us. I am not going over the ground that has been already covered regarding methods of performing enterostomy, but am simply going to relate a case which happens to be in the hospital at this time. It has been my fortune to have a rather unique case, namely, a girl

who has been operated on three times for obstruction of the bowel. I operated on her a year ago for an acute appendicitis, with suppuration, from which operation she made a good recovery. Six months later she was operated on, in my absence from the city, by a colleague for an acute obstruction of the bowels, with perfect relief. About a month or so ago, while skating, she was seized with obstruction of the bowel, and I operated on her the second day after the attack. The obstruction was at the upper part of the ileum; and after liberating bands and separating adhesions, I was able to establish perfect patency of the intestinal tract. Two weeks later the same girl came to see me again, on account of obstruction of the bowels with enormous dilatation of the entire small intestine. I do not remember ever seeing such a tremendous dilatation as was noticeable in this case, and this was filled with the same kind of fluid as has been described in cases of acute dilatation of the stomach. I was forced to adopt the method of Moynihan, because there were two ecchymotic spots, and the one immediately above the ileocecal valve sloughed out. By measure there were three quarts of this black fluid, which was largely made up of bloody material at the time. I substituted for the fluid immediately normal salt solution, and attempted to close around the aperture as nearly as possible with silk stitches until I got to a place which I felt might slough. I closed a little portion one-quarter of an inch in diameter with a purse-string suture, and fastened it to the abdominal wall. This would hold at least until the absorption of the three quarts of salt solution. Normal patency of the bowel was established, and bowel movements occurred. The girl now has a fistula, and while she is not in the best condition, she is not dead.

We have to change our methods in these cases according to the conditions found.

Dr. A. L. Wright (Carroll, Iowa): I do not know that I can add anything of interest to this most excellent paper of Dr. Lord's. I wish, however, most heartily to endorse the views expressed regarding the treatment outlined, but particularly to speak from the standpoint of a patient who has recently suffered from this dread complication of a celiotomy, and to enter an urgent plea that the surgeon interfere early in these cases of septic ileus. The suffering is so intense and the danger so

great to life, we are justified in doing anything that will enhance the chance of recovery, and this certainly will.

In March last I had my first warning that there was trouble in my lower right abdomen, never having had pain in this neighborhood before. In six hours from the first manifestation of pain the appendix ruptured, and within six or eight hours more it was removed. At the time of the operation the lower abdomen contained much pus. Following this, for one week, I suffered intensely from the ileus that ensued, nor did I obtain relief until the ligature placed about the stump gave way, and allowed the bowel-contents to escape when it was then complete and I free from pain.

The great suffering endured at this time and the freedom from pain as soon as the tension was relieved, taught me a lasting lesson. If ever I meet with a case of septic ileus I shall pass into the bowel through the wound, guided by my finger, a pair of sharp-pointed scissors, open them wide and give free exit to the pent-up bowel contents. There can be but little danger from this procedure and much relief is sure to follow. The general abdominal cavity is protected before this emergency arises.

I feel certain we can save much suffering and many lives from one of the most painful deaths known. In behalf of the afflicted, I wish to urge the fellows to resort to bowel puncture early, in all cases of septic ileus.

Dr. Clifford U. Collins (Peoria, Ill.): The remarks made by Dr. Connell have raised another question in my mind, and that is, drowning of the patient in the fecal vomit. A few years ago, when Dr. Andrews' paper appeared, I saw a case in which a large amount of material came out through the mouth, the quantity being greatly in excess of that which could be contained in the stomach. Probably under the influence of the anesthetic the pylorus became relaxed, and a vast quantity of the material was forced into the stomach by the combined pressure of intestinal gases and the abdominal muscles from below. If that is the case, washing out the stomach preliminary to anesthesia would not prevent that trouble. Since then we have operated in the reverse Trendelenburg position, allowing gravity to keep the contents in the intestine, and so far that trouble has been obviated.

Dr. Van Buren Knott (Sioux City, Iowa): Enter-

ostomy, which has been so frequently mentioned this morning, has lowered the mortality in cases of intestinal obstruction very materially without question, but it has by no means eliminated it. It seems to me we may form the opinion from the general trend of the discussion that enterostomy in these cases, no matter how late it is done, would be a life-saving procedure; but that is by no means my own experience. I have had a great many cases in which enterostomy has been done, and the patients died just the same. Our mortality-rate has been greatly reduced by this operation, but it has been by no means removed.

I wish to speak briefly of multiple enterostomy, as mentioned by Dr. Coffey. This procedure has proven valuable. Taking up a knuckle of bowel, opening it by an incision, rapidly draining this part of the bowel into a receptacle, and closing it rapidly with a few sutures, has proven valuable in my experience, and if permanent drainage is to be established, the method mentioned by Dr. Coffey is preferable, that is, tying a glass tube in the wound. Tubes of large caliber can be readily placed. There is time lost in doing the Senn operation; and the criticism against the use of the catheter is very just. The catheter is too small in such cases.

Dr. Lord (closing the discussion): The discussion has brought out opinions similar to those published in the literature on this subject. I would not say that these opinions are given from limited experience, because that would be unjust to the men who have had extensive experience in this work, but much of it lacks approval of recent experiences.

The work of Dr. Monks has been mentioned. I have read Dr. Monks' recent article very thoroughly, but made very little use of it in my paper, because he really perpetrates the same old error, i. e., too much work undertaken in these cases considering the vitality of the patient.

As to the points brought out by Dr. Coffey and others regarding multiple incisions: When we drag out of the abdomen the distended loops of intestine and make multiple punctures, we may relieve some of them by the grace of God, but most of them will not be benefited to our satisfaction. The reason why I am advocating this form of enterostomy is because of its simplicity and because it removes the former objections to it, which have always caused it to be delayed too long. The importance of this is recognized by all, and it will not do to delay until the outcome is going to be questionable under any form of treatment.

This operation can be done on patients in good condition without any fear of the former consequences incident to enterostomy or artificial anus, which the old books are sure to mention. Enterostomy, as ordinarily done in the old way, would justify the label artificial anus. I do not advocate this measure (artificial anus) except in the very extreme cases. In one of the cases mentioned the Stewart procedure was used, and the upper part of the gut was left out because of an extensive peritonitis and because it was the quickest way of leaving the patient in a cleanly condition without immediate danger of soiling the peritoneum. If you have a knuckle of gut outside the belly it becomes softened, and unless you protect it with rubber tissue, the endothelium is removed, and it is not in a condition to be re-introduced into the abdominal cavity. A Murphy button introduced into the ileum, according to Stewart's method, destroys too much of the lumen. These dangers are avoided by the simple method I have recommended. The use of the Paul tube is an old-fashioned disgusting thing that leaves the patient with intestine outside of the abdomen, and is little better than the Stewart procedure, and anybody who tries the measure I have recommended would not have any more use for it. The Mixter tube is only an imitation of the Paul tube. The time required has been raised as an objection. Here is a procedure that can be carried out in five minutes time. It is an easy matter to do a drainage operation under local anesthesia, and the shock is not sufficient to be of consequence. In a larger proportion of instances this operation should be done early. This must be left to the judgment of the operator and also as to how much should be done, or what he should not do.

ABSCESS OF THE BRAIN, WITH REPORT OF TWO CASES

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McCune says that abscess of the brain should be divided, for convenience's sake, into three stages. These stages differ from each other in a marked degree and indicate the progressive stages through which the disease passes in cases uninterfered with.

I do not intend in this paper to treat of traumatic abscess, that is, those cases due to fracture of the skull or injuries to the head, but to limit the discussion to those infective brain-abscesses arising secondary to acute or chronic suppurative affections of some of the adjacent cavities, such as infections of the middle ear or frontal sinuses.

The great majority of cases in the initiatory stage will give a history of middle-ear disease characterized by purulent or semipurulent discharge from the external auditory meatus, accompanied by more or less pain at some previous time. Other cases will deny ever having had pain or discharge from the ear, but a careful examination of the external canal will usually disclose a discharge with perforation of the tympanic membrane. The discharge is sometimes very slight and consists apparently of not much pus, but chiefly of serum. The pain in the ear is first described as shooting or burning in character. At first the pain is confined to the ear, but soon extends to the temple and

mastoid regions, and later to the occipital and frontal regions. Pain is felt even in the frontal regions when the abscess is located in the cerebellum. As the disease progresses the pain increases until the patient complains most bitterly, often crying aloud on account of the great suffering. In other cases it is more neuralgic and paroxysmal in character and can be relieved only by large doses of morphine given hypodermically.

Vomiting is frequent and bears no relation to food or stomach disorder, and is usually without nausea. Rigors or chilly sensations are usually symptoms of the early stage. They may be severe or slight and hardly noticeable, but if looked for carefully they will be found to exist, or evidence of their previous existence will be established. These rigors should not be confounded with the more severe and repeated rigors of other acute affections arising from middle-ear or mastoid suppuration, such as sinus thrombosis, and they are differentiated from sinus thrombosis by their lesser frequency and severity, together with lack of tenderness along the course of the internal jugular vein. The temperature during the first stage is only slightly above normal, not reaching more than 99° or 100° F. The tongue is coated with a white thin coating, and the pulse quickened. The initial stage usually lasts from two to six days, when the symptoms are greatly changed, the patient passing into the second stage, which is characterized by symptoms of intracranial pressure. It is in the second stage that the surgeon first sees abscess of the brain, but quite often not until the third stage of the disease has made its appearance. At this time the patient lapses into a condition of stupor or mental dullness. He does not complain so much of pain as before, the senses are dull, and he passes a good part of his time dozing. He is easily aroused, however, and replies to questions slowly, though quite accurately, but it is with difficulty that his attention can be held for more than a short time, on

account of the tendency to doze off again into sleep. Percussion over the affected side is usually painful. The pain is complained of even in their stupid mental condition. This symptom I found to have been constant in my cases. The temperature in the second stage is generally near normal, ranging from a degree above to a degree below normal. The temperature, on account of its tendency to be subnormal, is quite typical of brain abscess, as is quite the contrary in sinus thrombosis and other acute infections that it may be confounded with, such as meningitis arising from a spreading infection of the middle-ear.

The pulse in this stage is slow, not more than 50 or 60 beats per minute, and may reach as low a point as 30 or 40 per minute. The respiration at this stage is also slow, but usually regular. McCune says that respiration is often reduced to as low as 11 per minute, and in cerebellar abscess is slower than in cerebral abscess, often irregular and of Cheyne-Stokes character. As the pressure of the abscess on the cerebellum affects the pons, the respiration often ceases long before the heart does. In one case of cerebellar abscess cited by McCune, life was prolonged for twenty-four hours by performing artificial respiration after natural respiration had completely ceased. Constipation is the rule, and is often obstinate. The urine is scanty and often retained, making catheterization necessary. The urine also contains albumin, which soon disappears upon draining the abscess. The appetite is lost, and the patient has to be encouraged to eat. Vomiting in this stage is not so usual as in the early stage, but in some cases it does occur throughout the entire course of the disease. Convulsions sometimes occur, but are not often a feature unless the abscess is located in or near the motor regions of the brain. Paralysis sometimes occurs from the destruction of brain-substance or pressure exerted upon conducting tracks. Paralysis is of importance in locating the seat of the abscess,

as it is quite evident that the abscess must be quite near to the centers involved in the paralysis. The breath has an evil odor that is quite characteristic in all cerebral affections. This is a constant symptom observed in my experience in brain cases. The odor cannot be described and can be appreciated only by coming in contact with frequent cases. It is present in brain tumors, as well as in acute infections of the membranes, and of the brain itself. Reflexes are not of much diagnostic importance. Optic neuritis is often present in the latter end of the second stage, and, when present, is an important diagnostic symptom, although it is present in other diseases of the brain, more particularly tumor.

The third or last stage of the disease usually ends in death when not treated surgically. However, abscesses of the brain have become encysted, remaining innocuous for years. Gowers reported a case that had evidently existed for twenty years. Death is usually due to a gradually increasing coma or to a leaking of the abscess upon the surface of the brain, setting up an acute leptomeningitis, which is rapidly fatal; or it may be due to a discharge of the abscess into one of the lateral ventricles. In case the discharge is into one of the ventricles the symptoms suddenly become alarming, and death ensues within a few hours.

The treatment of brain abscess is entirely surgical. The operation is performed in the following manner:

After shaving the entire scalp, the scalp is thoroughly cleansed by scrubbing with soap and water and applying some antiseptic dressing over night. The dressing I prefer is a pack of wet bichloride of mercury gauze made wet by wringing it out of a bichloride solution of the strength of 1 to 1,000. This may be followed, after the patient has been anesthetized just previous to the operation, by the application to the scalp of Harrington's solution, leaving the solution in contact with the scalp for not less than three minutes,

when it is washed off with sterile water. If these directions are followed out the scalp will be made reasonably sterile. There is no operation in surgery where greater care is required in rendering the operative field sterile and keeping it sterile than in operations upon the cranial cavity. The abdominal cavity will often tolerate an abundance of abuse and maltreatment, but not so with the cranial cavity. In cranial operations we have the meningeal membranes very prone to inflammatory processes; also the cerebrospinal fluid furnishing us a most excellent culture-medium when once infected, lighting up an acute leptomeninigitis that is always rapidly fatal. Knowing these facts, it is the duty of the surgeon to take every precaution to prevent infection during operations within the cranial cavity. If an abscess is suspected as a result of middle-ear or mastoid disease, it will be necessary to open the mastoid for the purpose of draining the antrum and middle-ear, if this operation has not already been done. The opening of the mastoid should be done immediately after the brain abscess has been drained, and not before. If this operation is done last it will often avoid infecting the cranial contents. A large or medium-sized trephine opening is made over the suspected seat of the abscess and the brain explored with a medium-sized trocar. If an abscess is near the opening the brain will bulge into the opening and will not pulsate. The trocar is introduced slowly and carefully in the direction of the suspected abscess, withdrawing the stiletto at every half-inch advance. If pus does not escape through the cannula after the trocar has been introduced to the depth of an inch or not more than an inch and a half, it is best to withdraw it and re-introduce it, changing the direction either upward, downward, forward, or backward, if pus is not reached. In case we are not successful in locating pus through the first trephine opening, other openings should be made and the brain thoroughly explored

through them. The cerebellar fossa should also be explored before abandoning the operation. I have missed locating two brain abscesses by being too timid and not carrying my exploration far enough. If a free flow of clear fluid escapes through the cannula either a brain cyst has been entered or one of the lateral ventricles. Sometimes the lateral ventricles will be greatly distended with fluid, as evidenced by the large amount of fluid escaping through the cannula. This has happened to me in one case and led me to believe that a brain cyst had been entered, when, in fact, it was a greatly distended lateral ventricle, the distention being due to pressure made upon the fourth ventricle by a cerebellar abscess. This symptom should always lead us to explore the cerebellum. After the abscess has been located by the trocar the opening into it can be enlarged by passing into it a pair of closed dressing-forceps, using them as a dilator, gradually dilating the opening until the finger can be introduced into the abscess cavity for the purpose of cleaning out any semisolid masses that may be present. Irrigation of the abscess cavity is not necessary and is dangerous. Drainage is necessary and may be accomplished by the ordinary rubber drainage-tube. McCune uses the decalcified chicken-bone drainage-tube. These tubes are not always obtainable, but in my opinion the ordinary rubber tube will be sufficient and will answer the purpose very well.

CASE 1.—This case was admitted to St. Mary's Hospital, Duluth, on March 22, 1907, and was referred to me by Dr. Lum.

Steve D., male, aged 31, gave the following history:

He was taken ill about the fourth day of October, 1906, with pain in the left ear; had been admitted to St. Mary's Hospital, October 19, 1906, remaining in the hospital one week. At this time a diagnosis of mastoid disease was made. He was re-admitted, November 2, 1906, and operated on soon after admission

by Dr. Lum for mastoid disease. He evidently recovered from the mastoid trouble at this time. A few weeks later and before leaving the hospital a swelling in the left cervical region just below the hairy portion of the scalp, made its appearance. At this time I saw the case in consultation with Dr. Lum, and a diagnosis of abscess involving the soft part of the neck only was made, located at the point of the swelling. This abscess was opened by Dr. Lum a few hours later. At the time of the consultation the patient was stupid, answered questions slowly and with difficulty, and had an occasional increase above the normal temperature, but most of the time his temperature was normal or subnormal in character. He improved so much that he was again discharged from the hospital, February 28, 1907, and re-admitted on March 22, 1907. At this time he was suffering from severe headache, making it necessary to resort to large doses of morphine, hypodermically. He was mentally dull and answered questions slowly, but usually correctly. His tongue was coated with a whitish, furred coating; breath very offensive; temperature, 97°; pulse, 60. He vomited almost daily after the last admission, the vomiting seeming to have no connection with the taking of food. His temperature never reached a higher point than 99° and was usually taken per rectum. Pain continued and was referred to the left side of the head, being also reflected toward the frontal region. At this time percussion over the temple and parietal regions on the left side was painful. There was no discharge at this time from either of the old wounds, neither was there any discharge from the ear. There were optic neuritis and stabile mydriasis of the left eye.

A diagnosis of brain abscess was made on April 3, 1907, and operation performed on April 4, 1907. The head was shaved and the first trephine opening was made over the left cerebella fossa, the dura incised,

and a trocar passed into the cerebellum in two directions. No pus or other fluid was found. This opening was closed after replacing the button of bone removed by the trephine. Another opening was then made in the skull by a good-sized trephine about one and one-fourth inches above the external auditory canal. The dura bulged into the opening, and pulsation was absent. The dura was incised, and the trocar passed into the brain, inward and downward, for about one and one-half inches. Nothing escaped through the cannula. It was then re-introduced directly toward the lateral ventricle for a distance of about one and one-fourth inches without result, and further exploration of the brain was abandoned. The wounds were closed by replacing the button of bone and without drainage. The patient died April 9, 1907.

The Post-mortem. — Post-mortem examination showed the cerebellum normal and a brain abscess occupying the lower temple lobe of the left side. The abscess was about one-half inch from the surface, three inches long by one inch deep, containing about four ounces of greenish creamy pus. The trocar used in exploring the brain at the time of the operation had missed the anterior horn of the abscess by only one-fourth of an inch, and if it had been directed posteriorly a little more, it would have entered the abscess cavity. This case emphasizes the necessity of more thorough exploration of the brain in suspected abscess. If we had not been quite so timid and made our exploration a little more thorough, this abscess would have been discovered, drained, and the patient's life probably saved.

Case 2.—John Benson, admitted May 17, 1907; aged 29 years. Family history was negative; also personal history as far as any specific disease was concerned. He was taken sick in February with earache which lasted two weeks, and pus discharged from the ear four or five days. He had been ill about six or

seven days when admitted to the hospital. At this time he complained of being very dizzy. He gave a history of having had headache some time in the beginning, but no headache at the present time. He vomits nearly everything taken into the stomach; has ptosis of the left eyelid; pupils react normally, sees double when looking with both eyes; tongue coated, and breath foul. Temperature is normal; pulse normal; bowels constipated; appetite poor. Temperature at no time during his illness has been more than 98.4° and has been subnormal most of the time. The pulse ranges from 60 to 80 per minute; bowels are very much more constipated; vomiting continued at intervals throughout the entire course of the disease, often being induced by assuming the upright position. The vertigo greatly increased as the disease progressed, becoming so marked at times that he could not stand without falling. At this time, which was about thirty days after his admission to the hospital and thirty-seven days from the onset of the disease, a diagnosis of abscess of the brain was made, probably located in the cerebellum.

Operation.—A trephine opening, medium sized, was made about one and one-fourth inches above the external auditory canal. When the dura was exposed it bulged into the opening made by the removal of the bone; pulsation was absent. The dura was incised at this point, and the trocar inserted about one-half inch. When the stilette was withdrawn a copious flow of clear fluid occurred. This fluid was evidently under quite a pressure, as it spurted through the cannula. The amount evacuated was about eight ounces. Believing that the trocar had entered a brain-cyst, further exploration was not deemed advisable, so the cyst was treated by drainage, death occurring about thirty-six hours later.

The Post-mortem.—The brain was removed, the surface appearing normal except over a small area

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corresponding to the petrous portion of the temple bone on the left side. On section of the brain it was discovered that the trocar had not entered a cyst as supposed, but the left lateral ventricle, greatly distended by a cerebrospinal fluid. The pressure of the fluid had caused a thinning of the cortical substance of the brain over the ventricle until it was not more than one-fourth inch thick. Upon section of the cerebellum an abscess of the left lobe was discovered containing about one ounce of thick, green-yellowish pus. The abscess cavity was heart-shaped and contained considerable solid matter. Although we had suspected cerebellar abscess for the reason that the most tender point on percussion was over the parietal bone, we opened into the temple region first instead of the cerebellar fossa, and laboring under the impression that we had drained a brain cyst the cerebellar fossa was not opened. The abscess had apparently made pressure upon either the fourth ventricle or the aqueduct of Sylvias in such a way as to prevent the free and equalizing flow of the cerebrospinal fluid, consequently causing the distention of the lateral ventricle so that when tapped by our trocar it led us to believe that a brain cyst had been entered. This symptom, the great distention of the lateral ventricle, if we had recognized it, should have led us to explore the cerebellum at once.

In conclusion, I desire to make a plea for a more thorough and systematic exploration of the brain in suspected abscess. From the experience, observation, and study of these cases I am satisfied that, as a rule, the surgeon of ordinary experience is far too timid in his exploration of the brain in suspected abscess. These cases are absolutely hopeless unless the abscess is located and drained. Knowing this to be the fact, we are justified, in my opinion, in undertaking almost any operative procedure in our efforts to locate and drain such abscesses. I remember the late Dr. Fenger

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demonstrating what he termed his systematic exploration of the brain for suspected abscess before the surgical section of the American Medical Association at its meeting in St. Paul, in 1901. I was surprised at the time with what seemed to me Dr. Fenger's reckless disregard of the brain. He used a skull to demonstrate his method, with numerous trephine openings through which he introduced his trocar or aspiration-needle, passing it first in one direction, then in another, if pus was not found, until the entire hemisphere had been explored. I am now of the opinion that his method is the proper one and that we are more apt to err upon the side of caution than otherwise. In my future cases I am determined that my exploration shall be sufficiently exhaustive that abscesses like the last two will not be overlooked, believing that exploration of the most searching charcter is not only justifiable, but demanded, in order that the lives of at least some of these unfortunates may be saved.

11

SPLENIC ANEMIA IN A FIVE-YEAR-OLD BOY

VAN BUREN KNOTT, M. D.

SIOUX CITY, IOWA

As the literature upon splenic anemia or Banti's disease has, during the past five years, been as voluminous as it has proven contradictory, I shall make no effort to still further burden it with conjectures or with unproven opinions. It is my desire to place on record a case occurring in a five-year-old child, which has proven, so far as the literature at my command reveals, the earliest age at which the condition has been noticed.

Master G. C., aged five years, male, of American parentage.

Family history: Negative.

Previous history: Started to walk when fourteen months old; four months later he became unable to walk for some unknown reason, and at the same time he developed squint in both eyes, recovering completely from both difficulties in six weeks. The following year he contracted measles and whooping-cough, but recovered completely with no sequelæ. Six months ago he began having attacks of severe abdominal pain, which usually appeared at night. These attacks came on nearly every night, were invariably accompanied by vomiting, and would persist for a time varying from ten minutes to several hours.

A physician who was called at this time noticed an enlargement of his spleen. His mother noticed a steady and progressive loss of weight and strength.

Present condition: The child presents an extreme degree of anemia, is poorly nourished, and complains of feeling tired. Upon physical examination the spleen is found to be very much enlarged and tender to the touch. All other organs normal. The child is unusually bright and intelligent.

Blood examination, November 12, 1908: Hemoglobin, 32 per cent; reds, 1,762,400; whites, 5,890; neutrophiles, 78 per cent; large lymphocytes, 4 per cent; small lymphocytes, 17 per cent; myelocytes, 1 per cent.

Upon these findings a diagnosis of splenic anemia was made, and splenectomy performed November 14.

November 19: Blood examination showed hemoglobin, 60 per cent; reds, 2,356,000; whites, 4,560; neutrophiles, 70 per cent; large lymphocytes, 6 per cent; small lymphocytes, 19 per cent; myelocytes, 3 per cent.

November 24: Hemoglobin was 70 per cent; reds, 3,760,000; whites, 3,800; neutrophiles, 63 per cent; large lymphocytes, 70 per cent; small lymphocytes, 28 per cent; myelocytes, 2 per cent.

December 3: Hemoglobin, 82 per cent; reds, 4,240,300; whites, 4,250; neutrophiles, 62 per cent; large lymphocytes, 8 per cent; small lymphocytes, 28 per cent; myelocytes, 1 per cent.

As may be gathered from the above-recorded blood counts, the boy's improvement, following the operation, was most rapid and gratifying. He rapidly regained his strength, his appetite became ravenous, and upon the fourteenth he was up playing around the hospital. It was thought advisable to keep him under observation a few days longer, and he was not per-

mitted to leave until December 4, twenty days after the operation.

Rarely have I seen a patient improve so rapidly as did this boy, and while it is much too early to consider this improvement as permanent, the prospects are most gratifying.

The points to which I desire to call particular attention are:

First. The tender age of the patient.

Second. The steady and progressive nature of the illness and disability occasioned by it.

Third. The rapid convalescence and marked improvement, both in appearance and conduct, after the splenectomy.

Pathological report by Dr. E. W. Meis: Spleen is 17.1 cm. in length, 9 cm. in width, and 4 cm. thick; weight, 500 grams; purplish in appearance and has not the triangular basal surface, but is long, resembling the pancreas in outline.

On cut surface the pulp manifests unusual pallor, and microscopic examination shows striking increase of connective tissue throughout the entire organ. This tissue extends deeply into the pulp and encloses large numbers of white cells. The connective tissue around the vessels of the spleen is uniformly increased. No other departures from the normal were noted.

DISCUSSION

Dr. Charles H. Mayo (Rochester, Minn.): I do not know of any other case operated on for splenic anemia where the patient was so young. We have had eight splenectomies, three of the splenic anemia type; and all of them recovered. There is nothing to add except to congratulate Dr. Knott on the success of the operation.

Dr. Knott (closing the discussion): My reason for reporting this case was the extreme youth of the patient. I have not been able to find a recorded case occurring in a patient so young as this.

SARCOMA OF THE FIBULA

J. Clark Stewart, M. D.

MINNEAPOLIS, MINNESOTA

Two cases of this rare tumor observed recently is my excuse for bringing this subject before the Society. Owing to unforeseen circumstances I have been obliged to omit at present any discussion of the few reported cases.

My impression as to the rarity of sarcoma in this location is that the proportion observed by Gross in his classical article on sarcoma of the long bones, i. e., thirteen in one hundred and sixty-five, will not be widely departed from. Coley's two cases in seventy-one sacromata of pipe bones and Bloodgood's single case in the Johns Hopkins' Report would show still greater rarity, but undoubtedly many cases are not reported or are classed as sarcoma of the leg, without differentiation as to bone involved.

While the pathology, prognosis, and treatment of sarcoma of the fibula differ very little from those of sarcoma of the other pipe bones, still the position and functional character of the fibula allow of some interesting variations in the treatment.

The two cases which I report illustrate many of the variations seen in Gross' series.

Case 1.—Reported by the courtesy of Dr. J. E. Moore, whose patient she was.

Martha P., aged 8; German; of healthy parentage and a good personal history until March, 1908, when

a lump was first noticed at the outer side of knee in the region of the head of the fibula. This was slightly painful and was considered inflammatory, and poultices were used at first without effect. This tumor grew rapidly, and the pain became worse and interfered with the use of the leg. About six months after its discovery the mass had become so large as to interfere with the free motions of the knee, and this with the increased pain obliged the child to use crutches. There has been no apparent interference with her general health except a decided loss of weight.

On examination, a tumor the size of an orange is present, involving the upper part of the fibula and encroaching upon the popliteal space. It is rounded, hard, and smooth except posteriorly where there are two small rounded elevations.

Operation, October 24, 1908, by Dr. J. E. Moore. The upper third of the fibula was excised with the tumor through a vertical external incision. The fibula was divided at a point well below the tumor and was carefully separated from the adjoining structures. The epiphysis was not involved by the tumor and was removed separately during the operation.

The removed tumor was hard and lobulated and on section showed the shaft of the fibula running through its center surrounded by the tumor mass. The latter was smooth and cartilaginous in appearance and contained much new bone in plates and spicules. Under the microscope decalcified sections show a fibrosarcoma with spindle cells and much bone production.

This is the osteoid or osteosarcoma of the older authors, and the one giving the best results after operations of all kinds.

CASE 2.—This case is different in many respects.

Lily D., aged 13; American; referred to me by Dr. Strathern of St. Peter, Minn.

The patient is a well-developed girl and looks older

than her age. Family and personal history are good in every way. About one year ago, while skating, she hurt her right ankle, and it has remained swollen and painful ever since. There is no record of any treatment until three months ago. Dr. Strathern, after making a skiagram, operated by incising the external swelling and found, as he stated, the "bone necrosed and softened, the knife passing readily through it, but there was no pus." The skiagram showed a thickening of the lower end of the fibula, extending from three inches above the joint down to and partly involving the external malleolus. The compact bone on the outer side of the fibula seemed destroyed for the lower two and a half inches. There was also shown a distinct thickening of the periosteum of the same area.

At the operation tissue was removed and examined microscopically, and some was also implanted in a guinea-pig, as tuberculosis was suspected. The pig developed no tuberculosis, and sections were not clearly diagnostic. The wound was packed and given *x*-ray treatment, but the tumor grew steadily, as shown by later skiagrams.

On November 10, 1908, the patient came into my care. At this time there was a red fungous swelling over the site of the operation, and the tumor had attained a size of three and a half by two inches. Its general shape was ovoid, the surface smooth, and the consistence firm except at the site of the wound, where it was soft and pultaceous but non-pulsating. The ankle-function was unimpaired, but pain compelled the use of crutches. A piece removed from this region showed round-celled sarcoma under the microscope.

Operation, November 14, 1908.

As a precautionary measure an Esmarch constrictor was put on above the knee before scrubbing the parts, as it was hoped this might prevent dissemination dur-

ing the manipulations. An exploratory incision was made to determine the possibility of excision, and the tumor was found to have penetrated into the soft parts in front and between the bones.

Excision being out of the question a circular amputation was done at the junction of the upper and middle thirds of the leg, and the cuff was split externally and the whole fibula removed.

The removed fibula showed a central sarcoma involving its lower third, which had almost completely destroyed all bony substance, the old bone being represented merely by numerous spicules. The periosteum was intact except for a small perforation in front, to the inner side, and at the site of the former operation.

The cut tumor was reddish, soft, and pultaceous, and contained many small spicules of bone. Microscopic sections show an alveolar sarcoma with small round cells, but no giant cells, a rare type among the central bone sarcomata.

These two tumors present some interesting points of difference. As to malignancy the general rules as to sarcoma will apply; therefore in Case 1 the tumor was nearer the body in a younger patient and was of the periosteal type, all pointing to greater malignancy. Microscopically, however, it was compared with Case 2 and was of a much less malignant type, being a fibrosarcoma with a newly formed bony skeleton, one of the more benign of the bone sarcomata.

In Case 2 the location in the lower third of the fibula and its central origin in an older patient were points in favor of lessened malignancy, while histologically its type was much more malignant.

In each case the treatment was specialized to meet the individual conditions, with the understanding with friends and attendants that a favorable outcome must depend largely on the results of the after-treatment

by the Coley method of injection of erysipelas toxins.

In Dr. Moore's case it was thought that every possible advantage would be gained by excision followed by the Coley treatment rather than amputation.

In my case the same treatment was contra-indicated on account of the bad functional results following removal of the lower end of the fibula, and it was entirely out of the question when it was found that the soft parts were beginning to be involved. It was thought that the upper-third amputation of the leg with excision of the fibula would give all the benefit of the classical knee-joint amputation and give the patient a better stump.

In both cases I believe every purpose of a higher amputation was subserved, as I think there are no cases recorded of sarcoma recurring in a part of a bone distal to its original site, and in the other case the complete removal of the fibula would be the classical indication and was secured without sacrifice of usefulness.

The trend of the best modern practice seems to lean towards the ideas repeatedly advanced by Coley, that amputation at any point seldom cures sarcoma unless followed by the erysipelas toxins, and that excisions, resections, and amputations merely above the disease should supplant the disarticulations so long advised as the best and only treatment for sarcoma of the long bones.

Nothing can be more disheartening than the results of amputation for the small round and mixed-cell periosteal sarcomata, and for the same types occurring centrally, unless treated very early, while the successes attained by disarticulations in the central myeloid forms and the bone-forming periosteal types can in many cases be duplicated by less formidable operations.

The histologic type of any sarcoma seen and treated

before local or general dissemination determines the fate of the patient.

The softer periosteal sarcomata, as well as their prototypes in the central groups, after they have penetrated the bone and invaded the soft parts, are probably never cured by operation, and only rarely by the Coley treatment, while giant and large spindled-cell tumors are slow of growth and slow to form metastases, and thus make possible better results and permit of conservative operations.

With our present knowledge I think that every case of inoperable sarcoma and every case of sarcoma after operation should be given the Coley injection treatment, as the successes of this method have been too numerous and striking to justify any one in not giving his patient what is certainly a fighting chance for his life.

My personal experience with this treatment has not been large, but it has convinced me of its positive value. Using it as I have only as a last resort in inoperable cases, it has never failed to produce marked improvement, shown by shrinkage of the tumor and retardation in its growth, and in one case of sarcoma of the lower jaw I was able to obtain a complete disappearance of the tumor without recurrence during the ten years the patient survived.

Note.—May 5, 1909. I have just received word that my patient is well and without recurrence. The Coley treatment has been kept up quite steadily with small rest intervals.

DISCUSSION

Dr. James E. Moore (Minneapolis, Minn): I have been very much interested in Dr. Stewart's paper on account of one of the patients referred to being my own. Dr. Stewart has brought out the practical points. First, conservative operations are the proper ones. Those that are to be saved by operation can be saved by a conservative procedure; and those cases of the most malignant type are not and cannot

be saved by extreme operations, so that it is proper and right to remove the bone involved or part of it, at times, and take the chances, because the chances are no better with that operation than with amputation, high up, or disarticulation. Both of us have observed carefully that pathologic law we all understand, that recurrence in the long bones of a malignant growth of any type is more likely to occur in the proximal end of the bone. It was fortunate in that case that the disease was at the upper end. I left the lower end. The history of these cases show you can leave the distal and not the proximal end. You have seen cases in which you have removed a portion of the lower jaw for a malignant growth years ago, leaving the proximal end, and when the patient got a recurrence, it invariably occurred in the proximal end. You may go comparatively close to the distal end of the jaw and there will be no recurrence on that side. These two points are eminently practical. The parents of many of these patients will permit of a considerable operation when there is a chance for the preservation of the limb, whereas they hesitate before submitting to amputation until such time as the hope of saving life by extreme operation has been deferred too long.

Dr. J. W. Andrews (Mankato, Minn.): This paper has been especially interesting to me, for the reason that a few years ago I had a similar case. The tumor occurred at the distal end of the fibula, and involved a third or possibly one-half of the bone. I made a diagnosis of sarcoma, and after giving the matter some thought, recommended the removal of the fibula. The patient went to Rochester, where so many of our patients go, for final consultation, and the physicians there recommended amputation above the knee. The patient was not willing to submit to that operation, but returned, and concluded to take my advice of excision of the entire fibula. This I did, and she made a beautiful recovery, and has good use of her leg. I have had her under observation for six years since the operation was done, and it has been a great surprise to me to see how well she walks, and her health is good. She walks with very little limp. She tells me that the foot turns easier than the other one, but she gets along nicely with it, and is much better off than she would be with a wooden leg or with a stump.

Dr. B. B. Davis (Omaha, Neb.): I am very much surprised at the number of cases of sarcoma of the fibula you are meeting with here in Minnesota. I had supposed that

this disease was so rare that one might go possibly a lifetime without ever seeing a case. Of all the cases of sarcoma I have seen, there has only been one in which the tumor involved the fibula.

I have given considerable thought to the point at issue, as to whether it is necessary to resort to amputation in cases of this kind, and I have read with interest Bland Sutton's ideas on the subject. For a good many years he has been following this plan in cases of sarcoma of the fibula, going on the principle that in this particular bone the necessity for amputation does not exist to the extent it does in other bones. Even where there is involvement of the bones of the forearm, he would amputate above the elbow; whereas in a case of sarcoma of the fibula he does not, and I should feel interested to know the final outcome in these cases. It seems to me that the doctors used excellent judgment in regard to the treatment, Dr. Moore in excising the upper portion of the fibula, and Dr. Stewart in removing the entire fibula and doing only a low amputation. This gives a better functional result.

The point was made that if this conservative treatment will not do, probably amputation would be followed by equally satisfactory results. I believe, from what I have heard today, if these gentlemen can bring a little evidence later in regard to the permanency of cure, then I shall feel like doing this sort of operation rather than amputation in a similar case.

Dr. Jabez N. Jackson (Kansas City, Mo.): The rarity of these cases of sarcoma of the fibula prompts me to report briefly a case that came under my observation about a year and a half ago. The patient was a young man, about twenty-two years of age, who gave a history of injury of the leg some six months or more prior to the time he consulted me. The tumor developed at the upper end of the fibula and grew without much discomfort for some time, and then became somewhat painful, but not severely so. When he came under my observation the tumor appeared to be about the size of a large lemon, was soft, and semifluctuant. I made an incision, without making a diagnosis, to ascertain its nature. This incision disclosed a large hematoma, with absorption of the upper end of the fibula. I found that the entire tumor mass was made up of broken-down blood-clots. There was no evidence of even bone spiculæ in the material excavated. When cleared out, it was found that the upper third of the fibula, four inches in extent, was entirely gone, the lower

end of the fibula quite clear, and apparently no infiltration observable in the surrounding soft parts. It looked as though the contiguous parts were merely dislocated by blood-clots. This bloody material was removed for later microscopic examination, which disclosed the giant cells of myeloid sarcoma. At the time of operation, however, finding no evidence of infiltration of the surrounding tissues, I simply smoothed off the edge of the bone, cleared out the cavity, and packed it. The man went home and had no symptoms for a year; then he began to notice the reformation of the tumor at the site of the original disease, and two months later when he came under my observation I resorted to amputation of the lower third of the femur. The case is interesting on account of the fact that recurrence took place in less than a year afterwards at the site of the original tumor.

DR. STEWART (closing the discussion): I am greatly obliged to the gentlemen for their free discussion of my paper. One of the points I wished to bring out was one that has been spoken of by Dr. Jackson, that is, that myeloid sarcoma is the most benign of all simple sarcomas, but when it perforates the soft parts and becomes malignant, it invariably recurs after local operation, and amputation becomes necessary. A large percentage of our cures are in cases of myeloid sarcoma where amputation has been resorted to. There is a general impression in regard to amputations for sarcoma that they are hopeless. I know that Dr. Wheaton has gone on record a number of times to the effect that every patient upon whom he has operated for sarcoma by amputation died on account of recurrence of the tumor. We have three specimens of hip-joint excisions over in the University of Minnesota in our collection, the patients being still alive. One of them was a case of Dr. Dunsmoor's of large spindle-cell periosteal sarcoma of the lower end of the femur; one of Dr. Moore's ossifying periostitis of the femur and a myxochondrosarcoma of the lower third of the femur. These three patients remained well five or six years after amputation of the hip-joint.

As to Dr. Davis' remarks with reference to excision of the bones of the forearm: I think Bland Sutton is in error in regard to the results. Some of the beautiful results we have had have been excisions of the radius. The Johns Hopkins people have had several excisions of the bones of the forearm, with good results for central bone sarcoma in these

bones. Of course, the fibula is especially favorably situated for excision.

I was glad to hear Dr. Andrews' remarks about the good function after the removal of the lower end of the fibula because the ankle function would seem to be greatly impaired after such an operation. In this case of mine that could not be done, as the tumor had perforated between the two bones, involved the soft parts, and amputation was necessary; and we obtained the best possible result by excision of the whole of the affected bone.

THE TREATMENT OF TETANUS

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CHICAGO, ILLINOIS

An understanding of the pathology of tetanus is the key to treatment. The tetanus bacillus was discovered by Nicolaier in 1884, but was first obtained in pure culture by Kitasato in 1889. The organism is strictly anaërobic, and one of the few anaërobes that are known to be pathogenic to man. Wound-conditions of such a character that infectious material is carried deeply into the tissues, to the exclusion of oxygen, are necessary for the development of the germs. A mixed infection with pus organisms tends to favor the growth still further by abstracting the oxygen from the tissues and by producing a local necrosis. Experimentally, it was shown that small amounts of a pure culture could be injected without results, whereas, if associated with staphylococci, much smaller doses sufficed to produce symptoms. Tetanus organisms are not propagated by passing from case to case, but they spend the greater part of their career outside of the human body in some other host, or as harmless saprophytes. Their frequent occurrence in horse manure leads to the question whether they are normal inhabitants of the horse's intestine. They are notoriously resistent; heating to 80° C. does not kill the spores; the bacilli survive boiling for one minute, and are not destroyed by five per cent carbolic acid in ten hours. The spores live indefinitely in the dry state; therefore,

considering its ubiquity, its resistance, and its virulence, there is only one factor that prevents the disease from becoming epidemic, namely, its anaërobic character.

The bacilli remain at the point of infection frequently in such small numbers as not to be demonstrable, and it is unusual to find them in the blood or in remote organs. Diphtheria presents the closest analogy to tetanus, in that in both the germs remain localized and evolve a toxin which produces the clinical symptoms. They differ radically, however, in the way the toxin is disseminated. Diphtheria toxin circulates in the blood, and is accessible to serum injections, as shown by the ideal results of antitoxin treatment. Tetanotoxin, on the other hand, does not continue to circulate free to any extent, but early becomes most inaccessibly combined with certain nervous elements and cannot be reached by any known remedy, no matter how administered. That is why the antitoxin, though proven an antidote in the laboratory, has been so disappointing clinically. No matter how administered, it cannot reach the toxin to neutralize it.

Though the number of bacilli in the wound may be small, the amount of toxin produced is relatively great. The latter is remarkably poisonous; one three-hundredth of a grain is a fatal dose for man (Brieger). It has a particular affinity for the ganglion cells in the anterior horn of the spinal cord, and for the nuclei in the medulla. The toxin diffuses through the tissues around the point of infection, and Meyer and Ransom have shown how it enters the end of the motor neuron where it is not provided with a myelin sheath. The myelin sheath offers an absolutely impervious insulation, impenetrable alike both by the toxin and the antitoxin. The toxin cannot enter an injured nerve save at its termination, neither can the antitoxin. Gumprecht proved that the motor nerves, and not the

sensory, are the conductors of the toxin to the cord and medulla. Nor does it pass up in the lymph-spaces about the nerve, but always by way of the axis cylinders. On reaching the cord it enters into a union with the motor ganglion cells. By way of the commissure it diffuses to the other side of the cord, thence it passes upwards along the motor tracts. Another portion of the toxin is taken up by the lymph and blood from the wound, and thus gets into general circulation. Motor-nerve endings throughout the body then take up the toxin from the tissue juices and convey it to the cord. Thus the cord is soon being saturated with toxin, both from the motor nerves leading from the original wound and from all the spinal and cranial motor nerves. As the toxin is known to reach the cord by way of the motor nerves exclusively, is it not natural to infer that such portion of it as passes up a short nerve will reach the ganglia first, and produce the first symptoms? Thus, before the poison can reach the cord by way of the long nerves in the extremities, another portion of the same has entered the circulation, found access to the endings of a short motor nerve, like the inferior maxillary branch of the trifacial, reached the cord first, and elicited the first symptom, namely, trismus. This looks like a plausible theory to explain the occurrence of trismus as the first motor symptom, no matter where the primary infection is situated on the body. This is in harmony with the clinical findings in local forms of tetanus, involving a single extremity, or head tetanus. In local tetanus the infection is of a mild character; there is enough toxin produced to involve a section of the cord through the motor nerves leading from the wound, but not enough to get into the general circulation, at least not for a relatively long period. Thus we have in this form of tetanus primarily an involvement of certain muscle-groups in the extremities,

with trismus and general spasms later, if at all. The period of incubation is long, because the toxin all has to pass up some long nerve in an extremity, and not enough gets into general circulation to make the short cut mentioned above. These local cases are mild, as a rule, and generally all recover.

The period of incubation in tetanus represents the time required for the bacilli to produce their toxin, and for the toxin to reach the cord and evoke the first motor phenomena. A short period of incubation indicates that there is a virulent infection, that toxin is present in quantity, that the tissue juices contain it at an early stage, and that motor nerves throughout the body are conveying the poison rapidly to all portions of the cord. The longer the period of incubation the milder will be the type of the disease.

The toxin enters into some sort of a firm combination with the nerve-cells of the anterior horn and nuclei of the medulla. Whether this is due to its affinity for the cholesterin constituent of the cell is an open question. At any rate, once the union has taken place, there is no remedy able to break it up and neutralize the toxin, even if it could be reached by the antitoxin, and it has already been shown that this is not possible. The axis cylinders and motor-nerve cells are as effectively out of reach of the antitoxin circulating in the tisue juices as are the wires of the Atlantic cable insulated from the salt water.

To facilitate classification tetanus is divided into *acute* and *chronic* forms. Acute cases have an incubation of ten days or under, and chronic (or subacute) cases have a latent period of ten days or over.

TREATMENT OF TETANUS

The available tetanus statistics, from the very nature of the subject, are unreliable and show a lack of uniformity. Tetanus is comparatively rare, after all, and no one observer or clinic has had enough cases

in a year or series of years available for purposes of comparison under like conditions. Series of cases are collated from scattered reports, often incomplete. Recoveries will get into the literature oftener than deaths. Chronic cases that get well anyway are hailed as recoveries due to some special method of treatment.

The characteristic feature of tetanus is that by the time you have made the earliest possible clinical diagnosis from the appearance of rigidity, it is already practically too late for treatment, at least for serum treatment. Every motor nerve in the body is loaded with toxin and is conveying it to the cord. That means that if there is a fatal dose then on the way in these various nerves, no treatment, no matter what it is, can save life. Aside from prophylaxis, then, what is the problem? As soon as the diagnosis can be made, the steps in treatment are as follows:

1. Remove the source of further toxin supply by treatment of the atrium of infection.

2. Neutralize the toxin contained in the tissue juices by massive injections of antitoxin, subcutaneously.

3. Employ some remedy to allay the reflex excitability of the spinal cord.

4. Nourish and stimulate the patient, and tide him along until such a time when a toxin shall have been eliminated from the nervous system.

Prophylactic Treatment.—As a prophylactic remedy tetanus antitoxin is conceded to be of undisputed value, as proven by animal experimentation and in practice. It has been used in veterinary surgery most consistently, and with positive results. Thus, Nocard injected 2,700 horses, and no case developed among them, while of a similar series, not immunized, 259 developed tetanus. In many clinics and hospitals im-

munizing doses of antitoxin are being given in case of all suspicious wounds, notably Fourth-of-July injuries. As antitoxin is absorbed very slowly when injected subcutaneously, Rogers recommends the intravenous method. Injections should be made about the wound into the muscles and tissues, to neutralize the toxin formed before the nerves can take it up. To be safe, injections should be repeated several times weekly for several weeks, as the antitoxin is being continually eliminated. While tetanus cannot thus be invariably averted, yet if it does develop, the period of incubation will be longer, and the cases are generally mild, and recover. It is needless to add that to be most effective the immunizing doses must be injected at once after injury. Suter had twelve cases develop in spite of serum treatment, but only two died. This subject was discussed at the German Surgical Congress of 1906. Baer reported fifteen cases of tetanus developing after prophylaxis, of which four died. Krafft stated than an inquiry among one hundred French surgeons showed that twenty-one had seen tetanus develop under like circumstances. It was the consensus of opinion of the surgeons present that its value in prophylaxis had been amply shown. It is needless to add that proper wound-treatment is essential to prophylaxis in conjunction with the serum.

Curative treatment involves the following:

1. Local wound treatment.
2. Antitoxin treatment.
3. Spinal injection of magnesium sulphate, eucain-morphine, etc.
4. General measures, as food, medicine, proctoclysis, and nursing.

1. *Local Wound-Treatment.* — In the care of wounds, much more can be done in the way of prevention than of cure when the disease is already developed. Bearing in mind the anaerobic feature, such

wounds as Fourth-of-July injuries, compound fractures, gunshot and punctured wounds, street-car injuries and the like should be treated with a view of creating conditions in the wound as unfavorable as possible for the tetanus bacilli. To provide access of oxygen to all parts of the wound would suffice. In the Russo-Japanese war the Russians treated their wounds aseptically and had more cases of tetanus than the Japanese, who treated theirs antiseptically, notably with balsam of Peru.

Such general principles as the following should be observed, notably with a view to prevention:

1. Leave no foreign substances of any character in remote recesses of the wound.

2. Allow the wound to remain open, or enlarge it if necessary to secure good drainage.

3. Avoid escharotics or the cautery, or anything that will produce an eschar, as under the scab conditions are ripe for the development of bacilli.

4. Remove such tissues as are obviously destined to necrosis, especially tissues into which dirt has been ground.

5. Avoid dusting powders and iodoform-gauze plugs that prevent the escape of wound-secretions. Gutta-percha or cigarette drains and moist dressings are much to be preferred. The sealing of punctured wounds with adhesive plaster, collodion, or any of the much exploited antiseptic clays, is to be condemned. The use of peroxide of hydrogen is rational, owing to the liberation of oxygen.

Finally, special mention should be made of balsam of Peru. Experiments have been made with this substance which are very promising. Bockenheimer, in the Archiv f. Klin. Chir., Bd. 86, Heft 2, details some interesting experiments made with fatty substances. There are certain chemical substances which have an affinity for toxins. Snake venom is neutralized by the

cholesterin contained in the ox-gall, which the Indians applied as an antidote. This led Bockenheimer to try fatty substances in cases of tetanus. In the experiments about to be detailed, he used liquid and solid fats, with better results from the latter. The best results were obtained with balsam of Peru. The work was carefully done in the von Bergmann clinic and is above criticism.

Guinea-pigs were inoculated with infected splinters of wood, and then treated locally with balsam, by application and injection. According to the time allowed to elapse after infection, and before treatment was begun, the animals either ran a mild form of the disease or, at least, survived a much longer time than the control-animals, which invariably died. In some cases the disease was prevented entirely by early application.

Adding antitoxin to the balsam did not increase its effectiveness. Thus, balsam of Peru, a remedy readily available, was shown to have a counteracting effect on tetanus toxin, a discovery of no small importance. For this reason the use of the balsam in all suspicious wounds, in addition to the other measures mentioned, may serve the purpose of prevention. Whether these fatty substances contain cholesterin, which unites with the toxin, as in the case of the nerve-cells, remains to be definitely determined.

2. *Antitoxin Treatment.*—Antitoxin, in spite of its great experimental efficiency in animals and its undisputed value as a prophylactic, has so far proven extremely disappointing as a curative agent when the disease was fully developed. The reason for this can be readily appreciated when it is borne in mind that tetanus antitoxin, no matter how administered, can neutralize only that portion of toxin free and uncombined in the blood and lymph. It is immaterial how given,—whether subcutaneously, intramuscularly, intracerebrally, intravenously, subdurally, intraneurally,

or into the cord,—it matters little how, the result is the same. It circulates in the blood, neutralizes such toxin as may be contained there, and is excreted from the body. None of it reaches the nerve-cell where the toxin is locked up, and it is not certain whether it could break up the union, even if it were able to reach the spot. By the time a clinical diagnosis is made and the remedy administered, there may already be a fatal dose in the nervous system, beyond the reach of any specific remedy. For this reason antitoxin has proven of little use as a curative agent.

Von Manteuffel, as the result of a large experience in the Russo-Japanese war, declares that antitoxin is useless as a therapeutic agent. Bockenheimer has recently reviewed the material of von Bergmann's clinic, and has concluded that antitoxin, no matter how injected, gives no results. Relatively, many intracerebral injections were made, and death was hastened thereby. There were nine cases treated without antitoxin, with a mortality of 88 per cent; and twenty were injected, with a mortality of 85 per cent.

Suter reports 137 cases injected, with a mortality of 85.7 per cent of the acute cases, and 34.9 per cent for the chronic. Busch, of Koerte's clinic, injected thirty cases with a mortality of 70 per cent. Antitoxin did not lower the mortality in that hospital. Rose collected 124 cases in the Krankenhaus Bethanien, with a mortality of 83.8 per cent, in spite of antitoxin. Pfeiffer treated 93 cases with antitoxin, and 14 cases without it, with about the same mortality, namely, 50. per cent.

Trendelenburg, Riedel, Kroenlein, Bornhaupt, and Holbeck could see no benefit derived from the use of any method of antitoxin injections. I consider opinions emanating from large clinics, as quoted above, as nearer the truth than the results of compilations of scattered reports. However, the reports of various authorities are as follows:

Engelman, 54 cases treated with antitoxin, 28 per cent mortality.

Kohler, 42 cases treated with antitoxin, 43 per cent mortality.

Holsti, 171 cases treated with antitoxin, 41 per cent mortality.

Steuer, 311 cases treated with antitoxin, 43 per cent mortality.

Ullrich, 72 cases treated with antitoxin, 72 per cent mortality.

Busch, 54 cases treated with antitoxin, 66 per cent mortality.

Pfeiffer, 93 cases treated with antitoxin, 53 per cent mortality.

Lambert, 124 cases treated with antitoxin, 72 per cent mortality.

Brandenstein, 26 cases treated with antitoxin, 82.3 per cent mortality.

For the purpose of comparison, there is added a table of statistics compiled before the era of antitoxin.

Curschman, 912 cases, 44.6 per cent mortality.

Friedreich, 252 cases, 50.7 per cent mortality.

Hobart, 290 cases, 34 per cent mortality.

Worthington, 68 cases, 41 per cent mortality.

Various modes of injection have been brought forward from time to time, always with the hope that the remedy was being introduced more directly into the nervous system. These hopes have not been realized, however.

Cerebral injections as first practiced by Roux and Borel have been found entirely too dangerous and formidable a method of introducing the remedy. Whether injected into the brain substance or into the ventricles, the serum never reaches the cells in the medulla or cord. The only visible effect is a more hasty death.

Lumbar puncture held out some promise; however, the antitoxin thus injected is just as remote from the

cells in the cord as though given subcutaneously. There is no toxin in the cerebrospinal fluid to be neutralized. The remedy, when injected, passes from the cerebrospinal fluid into the general circulation and is excreted. Abrading the cauda equina with the injecting needle makes no appreciable difference, as only a very few axis-cylinders are thus exposed. Injections directly into the cord are too dangerous, even if they had any proven value.

Meyer and Ransom were the authors of the intraneural injection-method, which looked promising, as it was known that, inasmuch as the toxin passed up the motor nerves, its progress might be blocked by serum injections directly into the main motor nerves leading from the seat of infection. The nerves are exposed and injected until they are several times their normal size; this is repeated on successive days. The method has not proven of much value, although some favorable cases have been reported by Rodgers, Schley, and others. None of the cases of my series so treated recovered. The reason is obvious: even when injected directly into the nerve, the serum does not reach the axis-cylinders to any appreciable extent, but is disseminated in the lymph spaces around the nerve fibers. Only those few nerve fibers which happen to be injured by the needle-point have their axis-cylinders exposed to the action of the antitoxin. The effect is too infinitesimal to be considered.

Thus, a knowledge of the pathology has shown why all of these special injection-methods have failed clinically, and are no better than the subcutaneous method; for, after all, all that can be hoped from the antitoxin is to neutralize the free toxin in the circulation. If there is not already a fatal dose in the nervous system, the patient will get well.

3. *Spinal Anesthesia.*—J. B. Murphy, in 1904, first successfully treated a case of acute tetanus by aspiration of cerebrospinal fluid and injection of eucain-

morphine by lumbar puncture. I believe that along this line, aided by antitoxin and other general measures, tetanus can be most successfully combated. Tetanus patients die either of exhaustion due to long-continued tonic and clonic spasms, inability to take food and drink, or from paralysis of the heart and respiratory centers, the result of the action of the toxin. Those cases where these vital centers are early involved cannot get well under any treatment. However, there is a large proportion of cases, if we can cut off further influx of toxin into the nervous system and eliminate the spasms, that will recover.

S. J. Melzer, in 1905, first published the results of his experiments with magnesium sulphate. "Intraspinal injections of magnesium sulphate in doses which do not affect the respiratory or heart center are capable of abolishing completely all clonic convulsions and tonic contractions in cases of human tetanus and experimental tetanus in monkeys. The relaxing effects of the injection may last twenty-four hours or longer. Subcutaneous and intravenous injections are accompanied by symptoms due to the depressing effect of the drug upon higher centers of the cerebrum and medulla; therefore, for therapeutic purposes, the intraspinal method is the best. There may by some variation of the action of magnesium sulphate in different individuals. The same dose will produce in some a more marked effect than in others. Women and children are more susceptible than men, and require smaller doses relatively to their weight." The dosage has been arrived at, experimentally, as follows: Of a 25 per cent sterile solution of magnesium sulphate, 1 c.c. is injected by lumbar puncture for every twenty pounds of body weight in men; for women and children, the proportion is 1 c.c. solution for every twenty-five pounds of body weight.

It is best, with the first injection, to be very cautious and ascertain the tolerance to the drug. The initial

dose should be rather smaller than the average just given, for, if too large, it will result in paralysis of the heart and respiratory centers. It is probable that one case of my series, a boy, died of this cause. It is important to bear in mind that the use of magnesium sulphate is accompanied by positive danger unless strict precautions and judgment are exercised in its employment.

After the injection, within fifteen or thirty minutes, the spasms and muscular rigidity begin to relax. The exaggerated reflexes begin to abate and are finally abolished. The opisthotonos disappears, and the limbs and jaws relax and can be moved actively and passively without eliciting a fresh outbreak as before. The pains are relieved, and altogether the patient is transferred from an exceedingly distressing condition to one of relative comfort. He takes nourishment and enjoys refreshing sleep. The respite thus obtained will continue for about twenty-four to thirty-six hours, during which time the patient has been fortified against the renewal of the spasms. As soon as the rigidity and convulsions begin again to become a menace, the lumbar injection can be repeated. The dosage should each time be carefully estimated by a consideration of the intensity and duration of its effect on the patient. The injection should be made slowly, after having observed the usual precaution, and it is not material that any amount of cerebrospinal fluid be withdrawn. The injections can be repeated, as indicated, without limitations as to number, becoming less frequent as the symptoms abate. It is truly marvelous to see a patient transformed by this remedy from a condition of acute tetanus, and all that this implies, to a state of placid comfort. I am convinced that along this line of treatment lies our only hope of saving the lives of many of these otherwise hopeless patients.

Robert T. Miller (American Journal of the Medical

Sciences, December, 1908) collected reports of fourteen cases of tetanus treated with magnesium sulphate, of which eleven were given subarachnoid injections. Of these eleven cases, five recovered. Adding the author's two cases would make thirteen cases, with six recoveries. These cases were all of the very acute variety, and would practically have all died under the ordinary treatment.

Miller very properly calls attention to the paralyzing effect of the magnesium sulphate on the heart and respiratory centers. Several of the cases were given too large an initial and succeeding doses, and showed the toxic effect of the drug; and, at least, two died of respiratory failure, the effect of the injection. The respiration in some of the cases sank to four or five in the minute.

4. *General and Medicinal Treatment.*—Along with the antitoxin and magnesium sulphate we must employ every available agent that may be of service. Of importance are quiet, hygienic surroundings and good nursing, and plenty of easily digested food and much water should be given. Attention to the bowels is essential, and proctoclysis is of the greatest benefit. The usual sedatives can be given by mouth or rectum, and heart and respiratory stimulation reserved for the emergency.

SUMMARY OF THE AUTHOR'S CASES

The cases reported have been taken mostly from the records of the Alexian Brothers' Hospital during the last eight years. In this connection I desire to thank my colleague, Dr. M. L. Harris, for the use of his material, and Dr. G. J. Noger, of the resident staff, for his assistance with the records.

There are in all fifteen cases.

Acute cases, 10; mortality, 90 per cent.

Chronic cases, 5; mortality, 20 per cent.

Total, 15; mortality, 55 per cent.

These numbers are too small to be of much value. The series includes cases treated medically, with antitoxin subcutaneously, with antitoxin intraneurally, and with spinal injections of magnesium sulphate. A tabulation follows:

No.	Age	Source of Infection	Incubation	Treatment	Result	Remarks
1	Male, 45	Nail puncture of hand	10 days	Antitoxin subcutaneously and medical	Death on third day	
2	Male, 12	Blank cartridge wound of hand	7 days	Medical, chloral, bromides, et.	Death on third day	Rigidity of infected arm most marked
3	Male, 45	Nail puncture of hand	15 days	Medical	Recovery	
4	Male, 15	Toy pistol wound of hand	6 days	Subcu. Antitoxin, chloral and bromides, i. n. injec.	Death on third day	Brachial plexus exposed and injected
5	Male, 34	Cut hand on broken bottle in a stable	7 days	Intraneural injections, branchial plexus	Death on fourth day	
6	Male, 8	Splinter of wood in foot	6 days	Subcutaneous antitoxin	Death on second day	
7	Male, 40	Gunshot wound of chest	8 days	Subcutaneous antitoxin	Death on third day	Tonic and clonic convulsions, severe
8	Male, 43	Nail puncture of foot	3 weeks	Medical	Recovery	
9	Male, 13	Stepped on garden rake	9 days	Subcutaneous antitoxin	Death on fifth day	
10	Male, 44	Nail puncture of foot	14 days	Medical	Recovery	Trismus and convulsions, moderate
11	Male, 25	Nail puncture of foot	12 days	Medical	Death on seventh day	
12	Male, 50	Nail puncture of foot	3 weeks	Medical	Recovery	Trismus mild; neck stiff; not confined to bed
13	Male, 53	Gunshot of leg	5 days	Subcutaneous antitoxin	Death on second day	Continuous and severe convulsions. Death from asphyxia
14	Male, 8	Nail puncture of foot	6 days	Subcutaneous antitoxin, Mag. sul. by lumb. punc.	Death on fourth day	Did not die in convulsions. Possibly 3 c. c. of 25% mag. sul. was an overdose. He died of heart paralysis; weight about 60 lbs.
15	Male, 13	Comp. fract. of leg	7 days	Subcutaneous antitoxin. Intraneural in sciatic nerve. Seven lumbar punctures and injection 4-5 c. c. magnesium sulphate solution. Chloral and bromides, magnesium sulphate, hypodermically; 165,000 units of antitoxin were injected	Recovery	

CASE 14.—Jos. M., aged 8 years; admitted to the Alexian Brothers' Hospital in the service of Dr. M. L. Harris, August 19, 1908.

History: On August 12 he was playing in the back yard near the stable, and stepped on a nail which penetrated his left foot at the base of the great toe. The wound received no medical attention. August 18, six days after the accident, the first symptoms began in the shape of trismus, stiffness of the neck, and difficulty in swallowing. The next day, August 19, he was brought to the hospital with tetanus well developed.

Examination: Well-nourished boy; expression anxious and drawn; jaws could scarcely be opened; head retracted and neck stiff; no opisthotonos, but general rigidity; lungs and heart, negative; abdomen, retracted and of board-like hardness; exaggerated reflexes; no sensory disturbances; on sole of left foot at base of great toe is an innocent-looking puncture almost healed; no inflammation or pus infection; leucocyte count, 21,000.

Treatment: Wound thoroughly opened, and a small bit of stocking removed; cauterized with carbolic acid and alcohol; packed with gauze moistened with peroxid of hydrogen, and moist dressing applied; 1,500 units antitoxin given subcutaneously the evening of admission.

August 20. Fifteen hundred units under skin. Condition becoming worse. Some twitching of arms, but no general spasms. Opisthotonos developing; difficulty in swallowing.

August 21. All tetanic symptoms well marked; opisthotonos, general spasms, exaggerated reflexes, difficulty in swallowing and breathing. Abdomen hard; trimus marked; 8 A. M., 3 c.c. of a 25 per cent solution of magnesium sulphate injected intraspinally. Ten A. M., general relaxation; knee-jerks abolished;

no more spasms; 3,000 units under skin. Five P. M., general condition bad; pulse more rapid; respirations shallow and slower; opisthotonos and trismus marked. Extremities and abdomen relaxed. Reflexes of lower extremities abolished. He remained relaxed and had no further convulsions or twitchings, but the pulse became weaker and the breathing more shallow and slow. There was no spasm of the respiratory muscles. He died the same night of heart failure, with muscles relaxed, all except neck and jaws. It may be that the heart failure was due to the paralyzing effect of the magnesium sulphate. The boy weighed about 60 pounds, and estimating the dosage at 1 c.c. for every 25 pounds body weight, would make the dose injected a trifle high.

CASE 15.—Charley O'G., aged 13 years; admitted to Alexian Brothers' Hospital July 10, 1908, with a history of having fallen off a back-yard fence. Examination revealed a compound comminuted fracture of both bones of the right leg. The bones protruded through the stocking, and the wound was very much soiled. The wound was cleaned up in the usual manner without the use of an anesthetic, and temporary splints applied. During the first week the wound did nicely; there was no suppuration, but several small pieces of bone were discharged.

July 17. Seven days after injury, the boy first complained of stiffness of the neck and slight rigidity of the jaw; 1,500 units of antitetanic serum were injected subcutaneously. The sciatic nerve was exposed, and 1,500 units injected directly into the nerve on the right side.

July 18. Becoming worse; jaws more rigid and head retracted; 3,000 units, subcutaneously.

July 19. Tetanus well developed; opisthotonos; trismus; exaggerated reflexes; pains in back and legs; board-like abdomen; difficulty in swallowing; 3,000

units subcutaneously; 6 c.c. of a 25 per cent solution of magnesium sulphate was injected subcutaneously. Lumbar puncture made, and 3 c.c. of a 25 per cent solution of magnesium sulphate injected at 9 P. M.

July 20. General condition better, and patient much more comfortable. Limbs relaxed, pains relieved, and can open jaw somewhat and take nourishment; 3,000 units subcutaneously; towards evening the symptoms became worse again, and at 9 P. M. a lumbar puncture was made, and 4 c.c. of turbid fluid withdrawn, and 4 c.c. of magnesium sulphate solution injected.

July 21. Within an hour after the last injection the muscles relaxed, and the patient slept and had a fair night. No convulsions; lower limbs somewhat anesthetic; 3,000 units under skin.

July 22. Condition still fair, but spasm somewhat more severe than yesterday; 3,000 units under skin, and 6 c.c. of magnesium sulphate, subcutaneously.

July 23. Strong convulsions present again upon the slightest irritation; 9:30 A. M., 5 c.c. magnesium sulphate by lumbar puncture; 9:45 A. M., beginning muscular relaxation; 10 A. M., knee-jerks absent; ankle clonus and plantar reflex present; 10:30 A. M., all reflexes abolished; muscles relaxed; abdomen soft; pains gone; comfortable; 1,500 units under skin.

July 24. Patient somewhat rigid again, but no convulsions; reflexes returning; 1,500 units subcutaneously.

July 25. In extremely tetantic condition again in every way. Pulse very rapid and weak, and patient in extremis. He was so far gone that it seemed useless to give him another lumbar injection. A spinal injection of 5 c.c. of magnesium sulphate was made, and for several hours afterwards death seemed imminent. The spinal injection was not the cause of the cardiac and respiratory collapse. After several hours

there was relaxation, and the boy responded to the heroic stimulation which was meantime being administered; 1,500 units, subcutaneously.

July 26. Remarkable change for the better; says he feels all right; more completely relaxed than he has been for the last week. No convulsions, nor exaggerated reflexes. Able to open jaws slightly; 6 c.c. of magnesium sulphate, and 1,500 units, subcutaneously.

July 27. Condition remains good; 1,500 units, under skin.

July 28. Not quite so good; slept little; slight spasms; 1,500 units.

July 29. Rigidity and spasms returned, not not so marked. Lumbar puncture and injection of 3 c.c. of magnesium sulphate solution.

July 30. Slept better; taking lots of milk; choral and bromides by mouth; slightly rigid, but no spasms. Fairly comfortable; 1,500 units, under skin.

July 31. Condition fair and symptoms gradually abating; 1,500 units.

August 1. Four c.c. of magnesium sulphate by spinal injection was followed in an hour by complete relaxation, which persisted until the next day; 1,500 units.

August 2. Condition improving; not at all urgent; reflexes present and but slightly exaggerated; 1,500 units.

August 3. As there were some slight spasms and increased rigidity, a lumbar injection of 5 c.c. was made, and in an hour the reflexes were abolished.

August 5. Doing well generally, taking nourishment; sleeps fairly well; some spasms and rigidity coming on; a spinal injection of 4 c.c. of magnesium sulphate was done with the usual good results; 1,500 units.

August 7. From this time on the improvement

was steady. No more spinal injections were necessary. Sedatives were continued for some time, and nourishment was taken freely. The wound, which had been reopened and redisinfected, had healed nicely, and union of the bones was being established.

He left the hospital, completely recovered, September 1, 1908.

CONCLUSIONS

1. Prophylactic injections of antitetanic serum in cases of suspicious wounds are unquestionably of great value in preventing the development of tetanus.

2. After the onset of the disease, the local treatment of the wound, aside from the usual antiseptic measures, should include the use of Balsam of Peru, a remedy which has been shown to possess some antagonistic action on the tetanus toxin.

3. None of the many special methods of injecting the antitoxin has proven of value, and some of them are too dangerous for general use. Subcutaneous injections of serum in massive doses will yield equally good, if not better, results.

4. Spinal injections of magnesium sulphate solution, by eliminating the spasms, will tide many a patient on to recovery, who would die under any form of serum treatment alone. This form of treatment is destined to lower the death-rate from tetanus more appreciably than anything which has been advanced heretofore, including the discovery of the specific serum. Great care should be exercised in arriving at the dosage.

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DISCUSSION

Dr. M. L. Harris (Chicago): I do not think we ought to let this paper go by without some discussion. I think it is a valuable contribution, if for no other reason than showing us conclusively that when tetanus has once developed, antitoxin is practically useless, and that we should not waste time simply by injecting antitoxin, hoping for good results. We all agree fully, I think, that the best way to treat tetanus is to prevent it, and not have it. But passing over that point, we come to the cases which are brought to us with tetanus already developed, too late to try prophylactic treatment. I feel in these cases our hope must be centered entirely on the injection of some substance that will control the spasms of the patient long enough to permit the system to break up the combination of the toxins in the body and eliminate them. We know of no way of overcoming these toxins or hastening their elimination. If we can prevent the patient from dying from exhaustion, or from asphyxiation from spasm of the chest muscles long enough to permit the system to break up this combination, we may hope for recovery. Therefore, the best treatment at present seems to be magnesium sulphate injections. We must learn about these injections. I have used sulphate of magnesium in three cases, two of which recovered, and one died, the one mentioned by Dr. Hessert. In that case, as he has stated, I feel certain the dose he had was too much. He was a small boy. I injected him on the basis

of one c.c. for every twenty pounds of weight. While it stopped the spasms completely, he died from cardiac paralysis. So, I believe, we have much to learn yet in regard to the method of handling sulphate of magnesium. It is a most valuable remedy in the treatment of developed tetanus. As the danger lies in paralysis of the centers of the medulla, it is a good plan after the injection to set the patient upright, as it will allow the effect to develop more slowly in the upper centers, and perhaps avoid unnecessary marked effect on the upper end of the cord.

DR. DANIEL N. EISENDRATH (Chicago): There were several of Dr. Hessert's conclusions which, I think, ought to be especially emphasized. One was that every punctured wound or blank-cartridge wound ought to be converted into an open wound. There is hardly any need in laying emphasis on this point before a society of specialists. The one to whom to convey this information is the general practitioner. He should be taught that it is just as necessary to call in a surgeon to see a case of punctured wound, or, at least, to have it treated upon correct surgical principles, as it is for the surgeon to call in the general practitioner. The general practitioner, in the case of a blank-cartridge wound or a punctured wound of the hand or foot, is too apt to content himself with treating this as he would other wounds, clean the surface, and put on wet dressings, ideal conditions for the development of tetanus bacilli. They have necrotic tissue; they have anaërobic conditions just as they like them. The only proper way to treat these cases, no matter whether the wounds are in the hand or foot, is to anesthetize these patient; put on an Esmarch constrictor; and open the wound up from one end to the other, not simply contenting ourselves with opening the wound, but cutting away all necrotic tissue, and taking away the pabulum for the bacteria to develop there. It cannot be too clearly stated, that the moment the toxin has gotten into the system we are powerless unless sulphate of magnesium will help us. This remedy, of all remedies, ever since we have practically abandoned such things as chloral, morphine, etc., promises more than anything else, and the results Dr. Hessert mentioned and those quoted by Dr. Miller, in which a fairly large proportion of cases have recovered, certainly bid fair to change our statistics in this respect.

There is one point I especially noted in the article

of Dr. Miller, and that is this: He noticed in several of his cases that respiratory paralysis threatened life, and after injecting his patients, or while injecting them, putting them in the elevated head position, so that very little magnesium sulphate would run toward the respiratory centers, he did not have such respiratory paralysis.

Dr. F. Gregory Connell (Oshkosh, Wis.): I rise to report two cases in which I injected magnesium sulphate into the spinal column in cases of tetanus with seven- and ten-day periods of incubation in which there was little apparent effect on the course of the disease. Both terminating fatally.

Dr. Roger B. Brewster (Kansas City, Mo.): The essayist has given us a very ingenious explanation of the phenomena of tetanus, and he has given it to us as a salient fact, and not as a theory. I would like to have him, in his closing remarks, tell us how he arrives at the fact that the toxin travels only through the axis cylinder, that it must get in at the distal end of the nerve and nowhere else, and that it is limited in its time of reaching the centers purely by the length of the nerve. This is all very interesting, if true, and I do not say it is not. I want to know, however, how these conclusions were arrived at, and who is responsible for the theory.

As to the treatment of tetanus: I have recently had two cases come under my observation in our city, neither of them my case. One of them was a case of Dr. George M. Gray, a boy with a wound of the hand. He was brought to him with the jaws locked; was given antitetanic serum; the wound was thoroughly taken care of; and he was put on potassium bromide. He made a good recovery.

The other case was a young man, 25 years of age, with a wound of the index finger. He came into the service of Dr. Hertzler, who amputated the finger, gave antitetanic serum, put the young man on twenty grains of potassium bromide every four hours, and kept him under the same for about ten days, and it was ten days before the trismus was relieved. His spinal and neck muscles were all set, as well as the abdominal muscles, but on the tenth day he experienced relief, and made a good recovery.

The essayist properly stated that the principal thing is the prophylactic treatment of tetanus. I have to do

with a good many accident cases from one of our large packing-houses, and from the stock-yards, and in the three years I have been looking after these cases I have not had a case of tetanus develop, although many of them were of the kind in which one would expect it. A number of them have been punctured wounds of the feet by dirty nails, where they are covered with the excrement in the cattle-run. By laying the wounds freely open and using peroxide of hydrogen, and some balsam of Peru in the dressings, I have never had a case of tetanus develop.

DR. CHARLES H. MAYO (Rochester, Minn.): I would like to ask Dr. Brewster as to the time of the attack, and whether these were acute or chronic cases that he described.

DR. BREWSTER: I think the boy's injury consisted of a punctured wound from a nail. He happened to be out in the country when the accident occurred. He came to the hospital on the third day, after his jaws had set, and it was the tenth day before he got relief.

Regarding the other case: I do not know as to the time.

DR. MAYO (resuming): I think that when we come to consider new things in the line of treatment, the question of acute or late onset of the trouble, the incubation period, is the main thing. If we take the cases in which tetanus develops within seven or eight days, we shall lose eighty per cent of them, and of those cases that are taken after ten or twelve days, we shall save eighty per cent, so it makes a lot of difference.

DR. W. D. HAINES (Cincinnati, Ohio): In 1900 I looked up the statistics of this subject. At that time a statement was made in the Journal of the American Medical Association to the effect that five hundred cases died of tetanus within the first two weeks following Fourth-of-July accidents. I had occasion to look up our local statistics covering a period of ten years, coroner's records, and found there were 101 cases which had passed through the coroner's office during these years which had died of tetanus following Fourth-of-July wounds.

There is one special point with reference to what the essayist said as to the time of incubation, namely, the longer the time, the greater the number of recoveries,

the period of incubation in our cases varied from twenty-four hours to forty-two days, i. e., from the time the wounds were received until the symptoms first manifest themselves. I, like the rest of you, think the prevention of the disease is the *sine qua non* of the treatment, and we have enacted an ordinance in Cincinnati doing away with the toy pistol, the cannon cracker, and the torpedo cane. As the result of this we cut down the mortality the first year to a single death, and since 1902 we have had but few deaths from tetanus following Fourth-of-July wounds.

DR. HESSERT (closing the discussion): In my paper I pointed out that the shorter the period of incubation, the more virulent the disease; the longer the period of incubation, the milder the disease. If the incubation period was twelve or fourteen days, these patients got well; but those who had a period of incubation of only five or six days were the severe cases, and the shorter the time from the receipt of the injury to the onset of symptoms, the more virulent the disease.

In regard to the motor theory: That has been amply proven by Meyer and Ransom, and others, by animal experimentation. Guinea-pigs have been taken and injected, and it has been found that the toxin travels by way of the motor nerves, and not by the sensory. That is a fact, not a theory.

As regards the question of trismus: That is a theory. It looks pretty, and it may or may not be correct.

In closing, I would like to sum up what I consider to be the treatment of a case of acute tetanus, because the chronic cases get well. Aside from the ordinary treatment of the wound, I think balsam of Peru should be used. Injections of antitoxin should be given, three thousand units a day, and employed for days and weeks. One of my cases received three hundred thousand units.

THE PRESIDENT: Would you advise that in suspicious cases without symptoms?

DR. HESSERT: My remarks have reference more particularly to the treatment of acute cases of tetanus. These cases ought to receive injections of antitoxin twice a day for as many days as seems to be necessary, saturating the system with antitoxin, then give these patients, intraspinally, sulphate of magnesium. In the cases of women

and children who are susceptible, I would advocate smaller doses at first to find out the susceptibility of these patients. The injections of magnesium sulphate can be repeated every twenty-four, thirty-six or forty-eight hours. Our case received eight injections. As soon as rigidity supervenes, repeat the magnesium sulphate, and have the patient sit upright to prevent diffusion of the magnesium sulphate to the medulla. If you do not do that you may kill the patient. Support the patient, and as soon as convulsions begin to reappear, give the patient another injection of magnesium sulphate. Keep that up at varied intervals, and it will diminish the high mortality-rate of acute cases of tetanus. The chronic cases have a low mortality-rate.

SUBSEROUS APPENDECTOMY, OR THE REMOVAL OF ALL THE APPENDIX, EXCEPT ITS SEROUS COAT, AND THUS AVOID DISTURBING ADHESIONS OF THE APPENDIX TO OTHER VISCERA

E. M. Sala, M. D.

ROCK ISLAND, ILLINOIS

While the methods of dealing with most all forms of adherent appendicitis have been thoroughly thrashed out by various surgical societies and by printed works on appendicitis, yet I have been unable to find more than slight reference to the method I wish to present today.

After a careful search of the Index Medicus, and its tracings in the Medical Library in Washington, and a perusal of the works there on appendicitis, I was unable to find mention of the method except in two instances, and they were applicable only in a certain condition, that is, where the appendix could be outlined from base to tip, although covered by adhesions. In such a case, by an incision through its peritoneal covering along its entire length, the appendix could be readily shelled out.

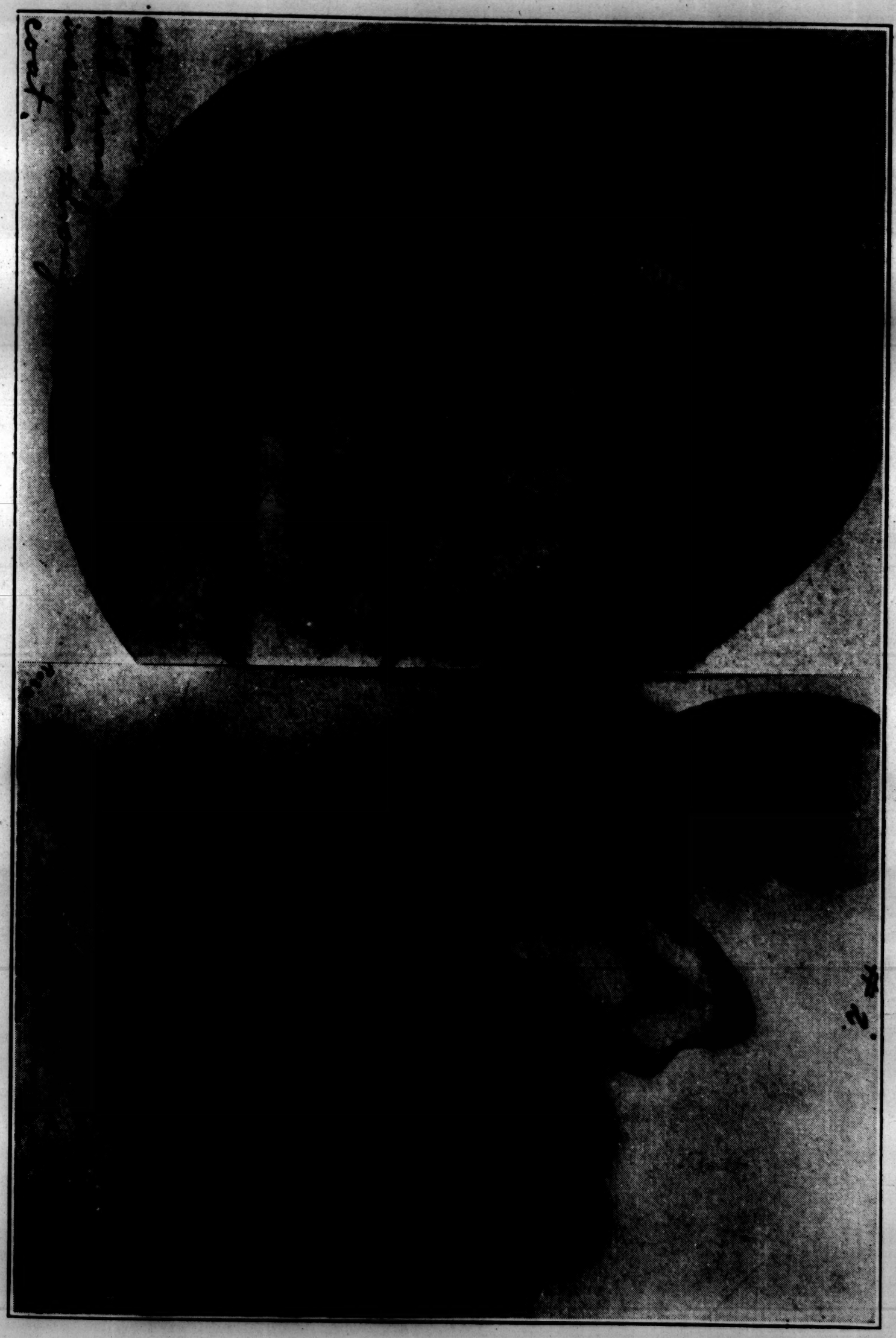
I was further unable to find any reported cases of this or the method in point, and yet I am quite sure that the surgeons, who are doing a great deal of work

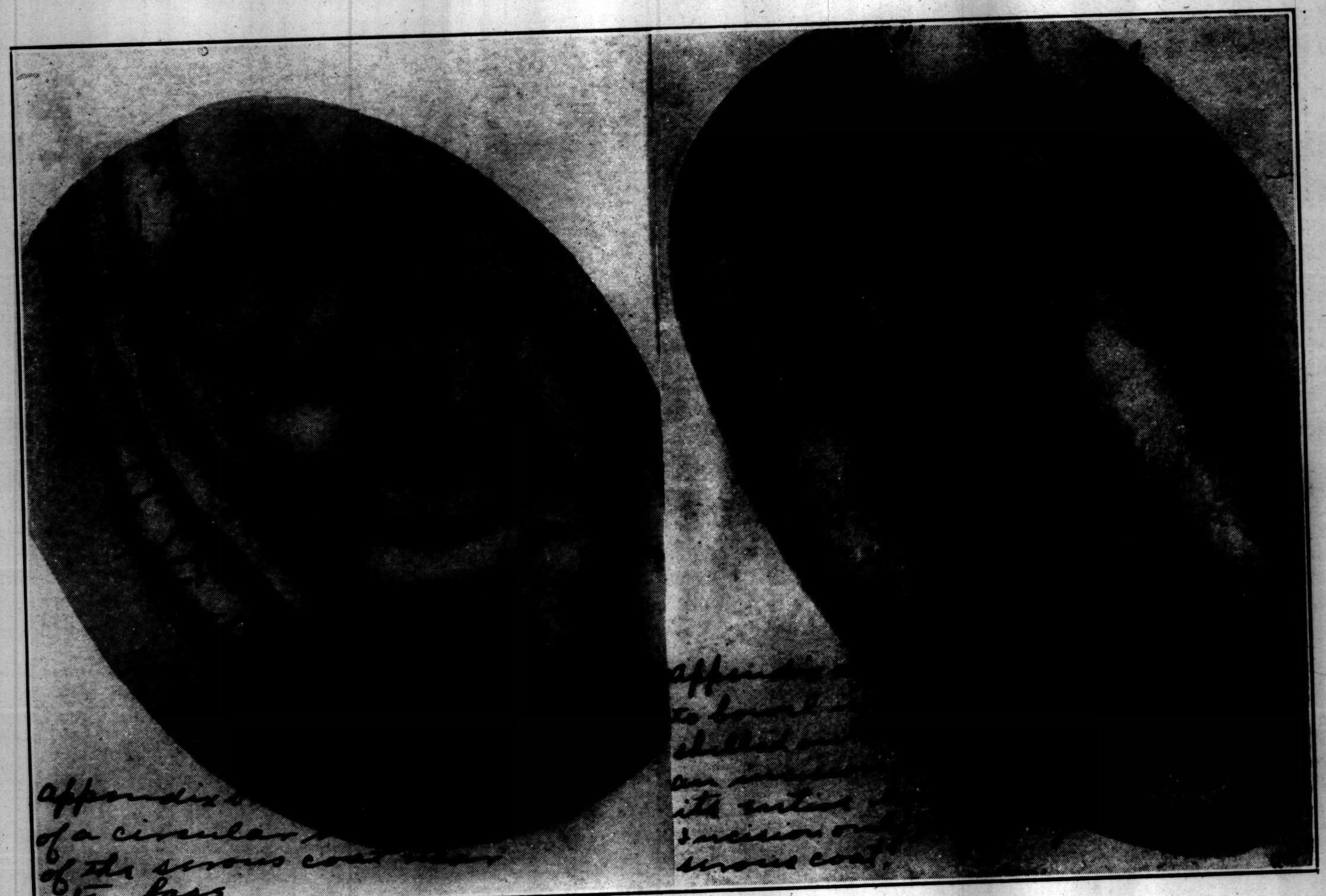
on the appendix, have removed the organ in the manner which I wish to relate.

Deaver's work on "Appendicitis," third edition, page 438, says: "Sometimes, either because it is subserous or because of adhesions, it is impossible to bring the tip of the appendix into the operative field. Under these circumstances it is often possible, after ligating and dividing the base of the appendix, to strip it out of its peritoneal coat, as a finger is pulled out of a glove: By thus removing all but the serous covering the entire area of infection is taken away, and the serous envelope cannot cause a recurrence of the disease."

Kelly says, on pages 575 and 576 of his work on appendicitis: "When the whole appendix lies imbedded in strong, old adhesions, and can be removed only by digging it out of its bed, there is considerable risk of tearing adjacent structures or of exciting hemorrhage by rupturing one of the numerous small vessels, which, being situated in the midst of the matted tissues, are difficult to control. In all such cases it is a good plan to detach the base of the appendix and then, catching the freed end with a pair of artery forceps, to lift it up and circumcise the organ just below the forceps, by cutting through the peritoneal and on to the muscular coats. A longtitudinal incision, including only these coats, is then carried down to the dorsum of the appendix as far as it is visible, after which the appendix can be stripped out of its bed by traction in the direction of the tip, or it can, sometimes, be delivered by a straight pull."

W. J. Walsham, M. B., Aberd., F. R. C. S., England, in a treatise on "Appendicitis," 1901, page 25, advises "that when the appendix is so adherent to important structures that the whole of it cannot be removed, it should be divided near its cecal attachment, the proximal end closed in the usual manner, and as





much of the organ removed as safety will permit, either by dissection or by shelling out from the peritoneal cavity."

Bull and von Bergmann, page 368, say: "If the appendix is so surrounded by adherent intestinal coils that their injury is likely to follow attempts at its removal, the operation had better be given up. Sometimes the appendix is so closely adherent to the wall of the cecum that it appears almost a part of it and cannot, with safety, be separated from it. In such a case the appendix may be split lengthwise, and its mucous membrane removed and ligated at its junction with the cecum and the wound in the appendix sutured.

"This procedure is very simple and avoids the severe hemorrhage which frequently follows rupture of extensive adhesions."

Murphy, under the head of "The Intermediate Operation," in his chapter on appendicitis (Keen's new work on Surgery), says: "The appendix is located by the meso-ileum or tenia-coli route described under the same heading. When found it is often very difficult to free it from the intestinal wall, the iliac vessels, the parietal peritoneum, the gall-bladder or the subphrenic tissues.

"When the mesentery is short and the appendix embedded in any of these structures, the best plan is to divide the peritoneal and fibrous coats of the appendix from base to tip, and shell out the mucosa. There is no hemorrhage, and ligations are unnecessary. The peritoneal and fibrous layers are closed with a whip stitch of catgut, the appendix amputated, and the stump imbedded, as described under technics of early operation."

The two descriptions, describing the removal of mucosa, are in reality a different branch of the subject, but as they offer another solution of the problem

of exposed adherent appendicitis, and as they were the only methods offered in these works, I have taken the liberty of quoting them.

While, no doubt, much more has been written regarding subserous appendectomy, and a great deal more been enacted by individual operators, although not written up, it occurred to me that an article on the subject, with report of cases, might be of interest.

The method I wish to speak about deals with the appendix, which is not only covered by adhesions, but the organ is completely out of sight and cannot be palpated.

Any method which locates where the base of the appendix should be, is adopted, usually, one of the three white lines on the cecum is traced to its termination in the base of the appendix. The base, having been determined, a circular incision through adhesions and the peritoneal covering is made, possibly only half of this incision can be carried out, that is, the part in front. A Kocher's director or other suitable instrument is pressed through this incision under the appendix anterior to the posterior peritoneal or serous covering. The director then supports all of the base of the appendix, except its serous covering. The peritoneal covering is then retracted on both sides of the director, similar to the way in which it is stripped back in the cuff-operation. The appendix is then doubly ligated, or ligated next to the cecum, and clamped distally. The cecal stump is inverted by reversed mattrass or purse-string, or by any other manner in which the operator chooses to dispose of it. The freed end of the appendix, which includes all of the appendix except its serous coat, is grasped with forceps, and by a gentle pull is shelled out of its serous coat, similar to the manner in which you would uncoil a section of intussuscepted bowel, the serous coat remaining attached to adjacent structures. Should pus

exist, or a perforation be present, there is a possibility that one might not succeed in shelling out all of the appendix. The part remaining is taken care of by nature and proper drainage.

A small rubber tube, covered with gauze and rubber tissue, corresponding in calibre to the stripped appendix, is carried into the cavity that was formerly occupied by the appendix, and is brought out through a stab-wound or through the original incision, the tube being fastened to the serous coat by a No. 1 catgut ligature, to prevent its being displaced too soon.

Should a fistula exist and the drain remain in place, it would seem that it would be a very favorable kind to heal, on account of its being lined most of the way by serous membrane. This, certainly, avoids breaking up adhesions, and, as Binne so beautifully says, "One must remember a cardinal rule in abdominal surgery, viz., sacrifice part of what is being removed if non-malignant, rather than injure a viscus."

CASE 1.—The first of the cases I wish to report was referred to me by Dr. H. He was a Greek, aged 38 years. There was nothing in his family or previous personal history of interest. His attack of appendicitis was of three weeks' duration.

Operation October 22, 1907, at St. Anthony's Hospital. The appendix was quite hard to find on account of extensive adhesions in all directions, but was finally located by anatomical bearings, such as ileocecal junction and termination of white bands, this being the point at which the appendix must terminate from the cecum.

What afterwards proved to be the base of the appendix was exposed by an incision penetrating the adhesions and serous coat only; a white cord presented, which at first appeared to be the right ureter, on account of its location, which was directly over the course of the ureter. A gentle pull on this cord caused

it to give way, and we found that all the appendix, except the very tip, had shelled out of its peritoneal covering. The organ had herniated into the ileocecal fossa. The appendix was clamped and ligated and the stump treated in the usual manner. The appendix, which was three inches long, was removed. The tip was left, and a rubber tube, covered with gauze and rubber tissue, was carried into the cavity in the serous coat down to the detached tip. This was left in place for several days and repacked with gauze every other day until the sinus was closed by nature. The wound was closed by three-layer, iodized-catgut sutures, the skin-stitch being subcuticular, and the patient made an uneventful recovery.

CASE 2.—M. W., aged 13 years, referred by Dr. S. The patient had suffered pain at McBurney's point for two weeks. He was operated on at St. Anthony's Hospital, January 18, 1908. There were numerous adhesions in all directions. The appendix was glued to the bowel and imbedded in the bottom of the abscess cavity. It seemed that a fecal fistula would surely result if the appendix were removed in the usual manner. An incision was therefore made through the serous coat at the base of the appendix, an instrument carried under the appendix, holding up all but the serous coat. The organ was clamped and ligated, the stump turned into the cecum, and the balance of the appendix, excepting the serous coat, shelled out of its serous covering. A cigarette drain was carried into the serous cavity and a double coffer-dam was placed in the wound after stitching the peritoneum to the skin on either side of the wound. The patient was put to bed in the Fowler position, and his recovery was uninterrupted.

In this case the appendix was already perforated, and yet the entire organ was shelled out of its serous coat.

CASE 3.—Mrs. M. B., aged 29 years, referred by Dr. B.

The patient had suffered pain during the past two years in the upper abdomen. The things she ate distressed her very much.

I was called to see her on April 26, 1908. She had been having pain four days, the first twenty-four hours in the upper abdomen, which was located at McBurney's point on the second day.

She entered Moline Hospital, and was operated on on April 27. We found an abscessed appendix, which was completely covered by adherent bowel and other adhesions. The appendix was perforated. The peritoneal coat was incised at the base, the appendix ligated and cut, and the proximal end folded into the cecum by reversed mattrass suture. The opposite end was grasped by forceps, and shelled out of the peritoneal covering. Fortunately, the whole appendix, excepting the serous coat, was shelled out regardless of perforation. A cigarette drain was carried into the cavity left by the removal of the appendix, also, a separate drain was carried down to the stump of the appendix. The wound was closed by three-layer catgut sutures.

Patient made an uninterrupted recovery.

CASE 4—Mrs. B. A. S., aged 30 years; case in my own practice.

The patient was operated on for removal of a right ovarian cyst, the appendix being removed incidentally. It was found to be herniated into the ileocecal fossa. The base of the appendix was located and the peritoneal coat incised, the appendix being ligated and treated as Cases 1, 2 and 3. It was quite easily shelled out of the peritoneal covering and found to be six and one-half inches in length. A cigarette drain was inserted in the cavity and brought out through a stab-wound external to our incision.

Recovery was perfect.

While four cases are hardly sufficient upon which to base a positive theory, yet I am quite sure that the method has a permanent place in surgery, and is the operation of choice in certain forms of adherent appendix.

CONCLUSIONS

1. The vermiform appendix may be shelled out of its peritoneal covering or serous coat.

2. The remaining serous coat cannot cause a recurrence.

3. This method of dealing with an appendix that is glued to other important structures, avoids the disagreeable sequences of loosening up strong adhesions and, in many cases, may preclude subsequent operations, which are always embarrassing to the operator and a continued misfortune to the patient.

DISCUSSION

DR. JOHN P. LORD (Omaha, Neb.): I have been in the habit of availing myself of this procedure in suitable cases, and I am reminded that as many as eight years ago, in Case No. 1 reported this morning, that was the technic pursued in a case where a young surgeon had operated for an hour and a half, trying to deliver the appendix, and failed, and by this means I was enabled to deliver it from the bottom of the pelvis. This procedure is valuable, in that it saves much trouble and danger, and I think should be understood by every surgeon.

DR. SALA (closing the discussion): I wish to pass around a second chart, showing the purse-string suture at the base of the appendix, the appendix being stripped out from the serous coat. There are no unfavorable cases to report from this method of treatment, as, fortunately, they were all favorable instances in which to do this operation.

TECHNIC OF CLEFT-PALATE AND HARE-LIP OPERATIONS

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It is presumable that all surgeons who operate upon cleft-palates have been impressed with the difficulties of technic and disappointing results which pertain to such operations. It is too bad that so little is said of the failures,—of the unsatisfactory prospective and end-results, of the discouragements, the slow retracing of lost ground, and the occasional unmitigated defeat. I doubt whether there is any other surgical condition which so often rebukes the surgeon's pride, or one to which the endeavors of members of this Association could be addressed with greater justice. Generally speaking, this is a despised department. A vainglorious surgeon will have little time for it. The large, handsome abdominal cyst will continue to attract him. He will not seek with avidity the thankless, profitless cleft-palate cases.

Lane of London said: "The treatment of cleft-palate has long been a matter of creed and tradition."

It is remarkable with what indifference old conceptions and practices, crudities of technic, and errors of judgment are passed from one book to another. Hare-lip pins are still used in a few distinguished clinics, that of Barker of London for example.

It has been said that to operate for cleft-palate on a child under three months of age is unwise. This is

a matter of tradition. It is now, with reason, contended that under ordinary conditions cleft-palate should be operated upon within the first week after birth. There is little substantial support for the statement that infants do not bear operations well. It is borne out by experience that the reverse is true.

Lane, who declared the best time for cleft-palate operations to be the day after birth or as soon thereafter as possible, and whose position at first seemed open to criticism, has now many followers.

Many operators have expressed an assured conviction that the new-born child bears surgery much better than has been imagined, the reasons for which circumstance, all previously stated elsewhere by Garretson, Brophy, Lane and others, are as follows:

1. The baby weighs more just after birth.
2. Resisting power has not been reduced by the breathing in of cold air through a roofless mouth.
3. Digestion has not been impaired by unsatisfactory feeding.
4. The bones are softer.
5. The impression of pain is not so acute.
6. The child has not developed the habit of articulating through the cavern of the nose.
7. By immediate operation the muscles of the palate are given an opportunity to develop, instead of atrophying, and there is afforded the greatest possibility of development of the nasopharynx as the result of the pressure exerted by the air as it passes through.

The very fact that the infant has just passed through the birth-canal, with all the brutal mechanical insults which may be incident to this excursion, suggests the presence of a tolerance to traumatism which becomes less evident as the baby grows older.

In ordinary cleft-palate operations, during the first week, the loss of blood should be trivial, but, how-

ever this may be, the danger from loss of blood is not greater than at a later period. Experience has not suggested the slightest foundation for the truth of the statement that young infants do not bear the loss of effect that a very young infant does not bear the loss of a given proportion of its blood as bravely as an older individual, I have no knowledge of it.

The vital resistance against trauma and hemorrhage of guinea-pigs and rabbits has a higher index upon the day after birth than upon succeeding days. B. D. Miers, of Indiana University, observed that "a baby rabbit can be operated upon up to twelve hours after birth without an anesthetic and with no apparent perception of pain, there being no outcry during such a procedure as the enucleation of an eyeball. Eighteen hours later, such operations cause the animal to cry out." Miers calls attention to a probable relationship between these phenomena and the circumstance that at the time of birth the sensory nerves are in an imperfect state of medullation and are therefore not good conductors. It is not known at what time medullation becomes complete in the human. Osmic acid is known to blacken medullated nerves, but the nerves do not blacken with this agent up to fourteen hours after birth.

Another phenomenon of interest in this connection, referred to by Miers, may be noted by removing, first, the heart of a rabbit twelve hours old and then that of another rabbit, an adult. The heart of the twelve-hour rabbit will continue to beat for an hour and a half, whereas the heart of the adult will cease almost immediately. This single phenomenon, if it may be taken to indicate anything, suggests difference in vitality, even if it be of an automatic sort, or a difference in sensitiveness to external influences.

Lane's statement that the success which attends these operations so far as the perfection of speech is

concerned, varies directly with the degree of possibility of development of the nasopharynx at the time of operation and with the freedom of this passage of air through it, is sound.

Lane ("Cleft-palate and Hare-lip," Med. Pub. Co., London, 1908) lays the utmost stress upon the importance of early nasopharyngeal breathing as a factor in the development of this passage. He regards the continuous ballooning of this tract by air as the greatest developmental factor, concerning not only the walls of the space but also the adjacent bones.

The conclusion that closure of the cleft in no wise remedies defective speech has been formulated by the observation of cases operated upon too late. Precise closure of the cleft does remedy defective articulation if the operation be done early in the period of growth. The only valid argument I know of in favor of delay is that which concerns the continued application of an adhesive-plaster strip, after Brown's suggestion, to bring the tissues on the two sides of the hare-lip into better relationship and facilitate a more normal development before operating. Another is, that prolonged regulation of feeding is important before, as well as after operating. It was shown in the case of a lioness in the Zoo at Berne that, whereas her cubs had previously all had cleft-palates, after she was put upon raw meat with the bones in it, the subsequent cubs had sound palates.

In operating for cleft-palate to obviate the collection of blood in the pharynx, the head-hanging position should always be used.

In cases of complete cleft, Lane's lateral gags with sharp teeth which bite into the gums, are the most convenient.

In complete cleft the jaw-clutch of the Whitehead gag is in the way of the operator at the anterior end of the cleft.

Lane's lateral gags, however, one placed at each corner of the mouth, allow free access to any part of the cleft.

The Whitehead gag in incomplete cases is excellent. The tongue-depressor attachment, however, must not be large enough to obstruct the breathing. Brophy's tubular speculum-gag limits access to the field of operation and adds to its difficulties.

In denuding the margins of an incomplete cleft, the strips of mucous membrane should be removed, if possible, from the entire edge in one piece, in order that the denudation may be complete all around. If the two sides of the cleft are denuded separately there is considerable likelihood that a small piece of mucosa may be left at the apex. In the presence of blood and mucus, obscuring the field of operation, such a small piece of mucosa may be allowed to remain, interfering with union at a critical spot. Denudation should begin at the tip of the uvular half upon one side and continue all around the edge of the cleft, finishing at the tip of the opposite half of the uvula.

In cutting off the strip the knife should be so held that more membrane is cut from the nasal than from the oral side of the palate. This facilitates co-aptation with mattress sutures. Binnie advises that this strip be cut in the reverse manner. It is difficult, however, to understand his reason for so doing. It is perhaps easier to bring the raw surfaces together with a simple suture if cut so that the oral side is bevelled. If, however, mattress sutures, as used by Sherman, are to be employed, the desirability of cutting with the bevel upon the nasal side is quite apparent.

In cases of protruding premaxilla with hare-lip, if the lip be repaired early, the pull of the repaired lip may force the premaxilla back into alignment. I have usually found it necessary, however, to loosen the premaxilla with a chisel upon the one side where

it is usually attached to force it back into the line of the normal alveolar arc and secure it with silver or malleable-iron wire. To bore the canal for the passage of wire in such a case or in compression operations like Brophy's there is no more convenient instrument than a shoemaker's awl to perforate the alveolar processes.

In cases of narrow cleft combined with a high palatal arch it is often not difficult to coapt the edges with mattrass sutures after the separation of the mucoperiosteum from the hard palate with Brophy's periosteotomes or dentist's scalers curved at right angles on the flat.

In cases of high palatal arch, if the cleft be not too wide, it is sometimes unnecessary to make paralyzing incisions for the relief of tension, for after separation the two flaps will fall together like the two halves of a cantalever drawbridge and may be sutured without tension. Of course the soft palate must be quite completely separated from the hard palate at the posterior border of the latter as emphasized by Barry.

The simple uniting of such loosened flaps with mattress sutures, as suggested by Sherman, is an ideal procedure in theory and a very satisfactory one in practice. The use of any mechanical contrivance like Brophy's lead plates and silver wire, or cleats of any kind, is to no purpose in such a case, if, indeed, they are ever desirable. When the lead plates are used, the strain comes upon the cutting edge of the silver wire. The most careful study of the mechanics of this proposition cannot convince one that the pressure is to any considerable degree distributed over the under surfaces of the lead plates.

The simpler the technic the better. Even many of the special instruments may be dispensed with. Small French needles serve admirably and there is no better needle-holder than a good Halstead artery-clamp,

the serrations upon whose jaws have been filed down a bit.

The less machinery there is in a child's mouth for it to poke at with the tongue-tip, the less the likelihood of failure.

Mayo and Sherman use five per cent iodoform gauze for the packing of the lateral incisions. The iodoform in the gauze, however, serves, it seems to me, no very important purpose and may do harm, as I have found, by inducing disagreeable if not alarming gastro-intestinal disturbances or actual intoxication. Sherman remarks that the iodoform controls saprophytic action. This, however, is by no means as important as the prevention of too prompt healing with coincident increase of tension. Plain, sterile gauze splints, the flaps as well, are, of course, more pleasant to bear in the mouth.

Sherman's practice of using tape filled with wax and impregnated with iodine to prevent absorption of bacteria and consequent infection of the mouth, represents an advance, perhaps, over the use of simple, unwaxed tape, as introduced by Charles H. Mayo, but there still remains in the use of the tape, waxed or unwaxed, some danger of strangulation of the flaps.

The results of the operation of denudation, loosening of the flaps from the hard palate, making of lateral incisions for relief of tension, mattress suturing, and packing of the lateral clefts with sterile gauze, will not be greatly improved by the addition of the encircling tape, waxed or unwaxed. In other words, the simple operation combining the suggestions of Sherman and Mayo seems most efficient if the tape be discarded.

Tying as large a rope of gauze as can be passed easily through the lateral incisions around the flaps, tying upon the oral side and tucking the ends back into the lateral incisions, has proven in a few cases

a better means of splinting the flaps and preventing tension than the use of the tape: it does not cut out so readily. The edges of the cleft should be united with horsehair or fine chromic catgut. Either is better than Chinese twist, silk, linen, hemp, silkworm gut, or wire. The disposition of silkworm gut to shape itself, owing to its springiness, into a ring is not infrequently responsible for the first laceration of the tissues, which results in complete cutting-out of the suture, and there is no hope for any cleft-palate operation in which there is tension of any kind on the sutures. Notwithstanding, enthusiasts have sought to apply compression methods in every case of cleft-palate at every stage. Thoughtful men will not ignore flap methods like that of Lane, in which a flap is turned over, door-like, it having been dissected free down to the edge of the cleft on one side and sutured to the freshened edge on the opposite side of the defect.

It is true of our section of the United States, at any rate, that only a small proportion of cleft-palate cases is seen by the surgeon during the first few weeks, and of these only a part are suitable cases for Brophy's method. The field of its application is therefore at present limited. Its use involves forcibly pressing together the two sides of the upper maxillary arch with consequent narrowing of the nasopharynx and vault of the mouth. If good judgment is not used in the selection of cases for the Brophy technic, this very beneficent operation will, of course, disappoint.

G. V. I. Brown (Journal A. M. A., February 1, 1908) has found that "where forcible means have been employed in early infancy to bring the sides of the fissure into direct or too close approximation, the arrested development of the maxillary bones makes the anterior portion of the mouth too small for accommodation of the tongue in the utterance of word-

sounds. This disadvantage is increased by the fact that on account of early derangement of the developing teeth, through forcible compression of the parts, not only are the incisors, cuspids, and bicuspids erupted in such position as to reduce the size of the dental arch, but frequently one or more teeth erupt almost in the central portion of the palate.

Elaborate staphylorrhapies are, no doubt, frequently made when small pivot flap-operations are best suited to the condition; and many palate defects considered hopeless, so far as Brophy's plan is concerned, can be corrected, for example, by Lane's method of pushing over flaps which embrace all the mucosa from the edge of the cleft to an arc on each side over and beyond the alveolus, it being assumed, of course, that the teeth have not yet erupted.

After every cleft-palate operation, the stomach should be washed out to prevent the fever that will almost surely occur otherwise.

In operating for hare-lip the importance of relieving tension by separating the nose from its deep connections, has been emphasized by Charles H. Mayo. As necessary, however, as this step may be, it is not more useful in practice than the measure of passing a fine chromic-catgut suture through the base of the septum and the base of the ala on the involved side, which, when tied, will draw and hold these attachments in the proper relationship for the establishment of a normal, narrow nostril. This suture is passed up through a transverse incision in the mucosa at its reflection from gum to lip. Even if the soft parts be quite freely separated from the bone, the unfastened ala tends to creep back into its abnormal position, maintaining a broad and unsightly nostril. The measure of keeping the nostril narrow with the buried chromic-catgut suture should always follow the loosening ot the nose from the bone.

In most cases of hare-lip, horse-hair sutures meet the indications. Both the deep sutures and those for precise coaptation of skin and mucosa may, as is well known, be of horsehair. Neither silk nor silkworm-gut sutures have any demonstrable superiority over horsehair. Horsehair suturing without dressing represents at once the simplest and most satisfactory practice.

In a certain very small percentage of cases, retention sutures may become necessary. For these silver wire may be used. When silver wire is used for suturing it is usually attached to a straight or curved needle by simply bending back one end of the wire after it is passed through the eye. It may, of course, be introduced somewhat more easily by using a needle armed with a loop of silk thread with which the wire suture is drawn into position.

If wire be threaded indirectly through the eye of a needle and doubled backward upon itself, there will be formed at the necessarily broad butt end of the needle an awkward lump. To jerkily draw this through delicate tissues, the lip of a young infant, must, in the nature of things, cause tearing and contusion which detract from the usefulness of the suture. The jerking of the lump of wire through the tissues is especially disagreeable after one or more sutures have been introduced and secured, the likelihood of loosening or displacing such already adjusted sutures being considerable. The entrance and erratic excursions of the loop of wire produce an unnecessarily large skin-opening and stitch-canal, and predispose tc infection and consequent "cutting out" of the suture.

To obviate these difficulties, I have used silver wire suture, to one end of which is attached with silver solder, after annealing of both metals, a full or half-curved steel needle. This gives a perfectly smooth joint, which may be drawn through delicate tissues

without adding unnecessary laceration to that produced by the needle point and which does not catch abruptly at the skin.

A good method of arranging the horsehair sutures in hare-lip is as follows:

After freshening the edges of the cleft margins of the hare-lip according to the method suitable in the particular case, the first horsehair suture is introduced at the top of the cleft. This top suture is tied and the ends left long. Then at the junction of the skin and the vermilion mucous border a similar horsehair suture is passed, precisely coapting the mucosa. It is tied and the ends left long. Traction upon the ends of these two sutures coapts the freshened edges of the cleft so that intervening sutures may be put in easily. Especially is this true of the horsehair sutures upon the mucous surface; the upper lip being everted and pulled upwards by traction upon the lower of the two guy sutures, the entire length of the freshened edges of the mucosa is exposed.

In order to avoid the occurrence of a notch on the lip after the wound has shrunken I have used the following practice:

After freshening is done according to one of the well-known methods suitable in the case, and after introducing the horsehair sutures as described above, a little roll of gauze about the size of the distal phalanx of one's little finger is fixed with its long axis transversely to the plane of suture, and the long ends of the uppermost and lowest horsehair sutures are tied over the little gauze roll so that the line of suture is wrapped, so to speak, around the gauze for about two-thirds of its circumference. This simple plan will effectively prevent notching after healing is complete, and, morever, it keeps the dressing in place and by gently stretching the wound margins maintains coaptation.

Lane almost invariably introduces two relaxation-sutures as follows:

He starts the needle upon the mucous side about a third of an inch from the edge of the cleft, passes straight through the lip, and out upon the skin side. He then introduces the needle at its minute aperture of exit and passes across the plane of suture to the opposite side, keeping the needle just under the skin and emerging again about one-third of an inch from the wound margin. He then passes the needle back through this second opening in the skin, penetrating all of the tissues of the lip, including the mucosa.

The suture is tied upon the mucous surface, an objection being that the knot is left upon the mucous surface where the infant will instinctively poke at it with the tongue.

Such sutures should be omitted if possible. Deep non-perforating sutures introduced from the mucous side answer as well.

DISCUSSION

DR. JOHN P. LORD (Omaha, Neb.): There are a great many things that might be said in discussing this paper. The matter of success in cleft-palate operations is one of evolution with the individual operator, and I hope you will pardon me if I use the first personal pronoun and tell you the way I operate on these cases.

I too am partial to Lane's method in those cases that have such broad clefts that the other methods are impractical. Here it has a wide field of usefulness. I undertook to carry out Brophy's idea of the avoidance of lateral incisions because of their prejudicial influence in interfering with subsequent muscular action. I have discarded his plates both before and after operation, and have tried to devise a means of my own to accomplish the same thing, and it is accomplished by retention sutures which will take up the tension. They take the place of the plates, can be easily introduced, and are readily removed. This is done by means of a double suture and small-sized pearl buttons. I thread one into a double suture that is introduced by means of a curved needle

after approximation sutures of horsehair have been used. After introduction of suture another button is threaded on to the double ends, and these are tied over it. It is a simple measure on the principle of a mattress suture. I used to use lead cylinders covered with rubber to get resiliency. Those were on the principle of the old quill suture, but would later drop out. I can use these buttons more quickly than any other method, and it is unnecessary to make lateral incisions through the palate muscles when there is sufficient tissue. Where they have a high arch and sufficient laxity of the soft palate to make approximation, this enables me to accomplish results without cutting muscular tissue. It is true, I have failed in some, but the failures have been due mostly to the fact that I had formerly insisted upon rinsing the nares and the mouth, and some of the children make such a desperate fight against this as to destroy union by the pressure of the tongue against the roof of the mouth. Therefore, I have come to the conclusion that all extensive efforts at cleansing after operations are not good practice. The suture I use for this retention is celluloid linen. I do not use horsehair in the lip, except for a few approximation sutures on the outside. These are removed on the fourth day. I usually use deep chromic sutures through the mucous membrane side. I do not have any marking from the lip sutures because these horsehair sutures, which are removed on the fourth or fifth day, do not produce any pressure necrosis. The method of Crile, or the use of the Junker apparatus for anesthesia, packing-off the pharynx, if treated by cocaine and adrenalin, will overcome efforts at vomiting, but in young infants it is quite impractical to undertake packing-off of the pharynx.

Dr. Charles H. Mayo (Rochester, Minn.): I think Dr. Eastman has very carefully presented this subject and that his conclusions are very fair. I was somewhat in doubt whether he left Hamlet out of my operation, or not, from the description he gave of it.

In the use of the tape (first taking up cleft-palate operations), there are two principles involved. If we have young children to deal with we can crush the sides together. It is a question in older children whether we will close by a push or a pull; that is, if the patients are along in years, we can resort to the old Ferguson operation, break through the bone on either side of the cleft,

pack it, crowd the margins together, and suture them at that time or at a later period of, say, eight days. The second method is by suture.

As to the question of the use of iodoform or any other agent in the mouth that is allowed to remain there very long: Coming in contact with the saliva will soon cause it become very foul. The compound tincture of benzoin is the best agent I have used. In the case of a child a few years old, if the cleft is wide, it is better to break the bone and bring the margins together, but if there is sufficient tissue to fill that space, it can be put together with a pull. The tape is of varying width. The picture shows the tape running too far forward into the bone. The idea was that where I had a failure we usually saw on the fourth day a bit of mucous membrane protruding from the nose down into the mouth, I would lose one-half or three-quarters of an inch, or the whole thing. Just at the edge of the hard palate back into the soft palate, the tape is passed around, which not only serves as a tension-suture to relieve tension, but it drains the nostril. There is no necessity for the child to blow the nose, for this tape acts as a tension-suture and a nasal drain.

Dr. Arthur T. Mann (Minneapolis, Minn.): I am very much interested in this subject, and would like to call attention to a little device, one of my tin splints, which I spoke about and exhibited at the Milwaukee meeting of this Association. If one will take a piece of paper and split it, so that it will go easily in the mouth, he can measure the distance of the arch, mark that on the tin,

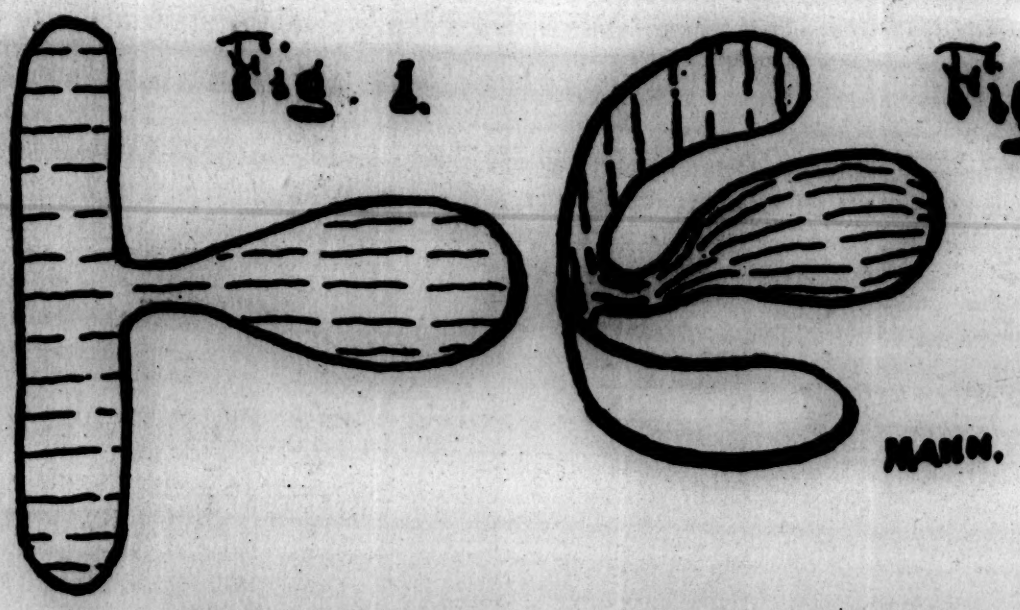

Fig. 1 shows the pattern cut from sheet tin.

Fig. 2 shows the protecting splint bent into shape for use.

make two wings, turn it up, bend this in any shape you please to fit the cheeks, and you have a support for your line of stitches, no matter what kind of operation you have done. The support gets its bearing against the sides of the hard palate near the line of the teeth. This (exhibiting) is ordinary tin. It costs ten cents a sheet. It may be wrapped with rubber tissue, and can be removed daily and cleaned. The best way to hold it in place is by using one strip of surgeon's plaster around the head.

Dr. James E. Moore (Minneapolis, Minn.): Dr. Eastman has called our attention to cleft-palate evolution. I operated on my first case some thirty years ago, which, needless to say, was a failure, and now I like to get these cases, because I can help them. I think many of the failures have been due to a non-observance of the surgical principles that have been mentioned by Dr. Eastman. It is very essential to make flaps so that they will come together without tension, and if this is done it does not matter what kind of stitches one may put in, nor how he puts them in—he will get results. I have not found it necessary to wash the mouth afterwards, for nature takes care of that.

Special instruments for this work are of no particular value. Every young man in undertaking this work is apt to think that special instruments are needed with which to do these operations. I have a lot of junk of that description that would fill a peck measure, and I use none of it. There is one special instrument, however, invented by Ferguson, which enables me to separate the flaps near the proximal end of the arch. I find difficulty with the ordinary instrument to get around this edge, but with this instrument I can do so. I have discarded the Brophy's periosteal elevators, and have used such instruments as I pick up—dental instruments, as Dr. Eastman suggests, or light bone elevators. I use an ordinary curved short needle, and no special needle. I use an ordinary needle-holder or simply a hemostatic forceps, and with this delicate instrument you can put the needle through, and there is no necessity of using another. By observing these simple rules you can get results where otherwise you would get failures.

Dr. A. M. Pond (Dubuque, Iowa): I believe a very common source of failure in these cases is the intense use of anesthesia and the haste of the operator to get through

with the delicate work as rapidly as possible. We have been appropriating a principle that is quite elaborate and simplifying it by taking a large-mouth bottle or jar and placing therein our ether, having a cork that is perforated by two glass tubes, both of them bent at an angle, one of them attached to the tube that is passed through the nose and into the upper part of the pharynx, the other attached to a syringe bulb. The bottle or jar is placed in an ordinary instrument-tray in which there is warm water at a temperature of 104°. This heats the ether, and the current of air which passes into the surface bottle carries with it the vapor of ether. It will surprise you what little anesthesia is required to keep the patient comfortable.

I wish to commend Dr. Eastman very heartily on his paper.

DR. F. A. DUNSMOOR (Minneapolis, Minn.): I have been delighted with Dr. Eastman's frank presentation of this subject, because with his experience he has intimated that he also has had some failures so far as the immediate union of the parts is concerned.

I want to confess that about thirty years ago I made my first operation in a case where the cleft-palate was accompanied with hare-lip. Parents in ordinary cases are generally unwilling to have an operation performed; but as the child in this case was a monster they doubtless hoped it would die. The attending physician said to me, "You can try and see what you can do in this case, as the parents are not particular whether the child dies or not." I operated similar to Brophy's method and the child got well, with a very good result. The child had a high arch and very narrow upper jaw.

I had the pleasure of observing Mr. Lane of London do some of this work, and he certainly put confidence into me. I have watched with great interest his method of the door-flap and have had the temerity to use it occasionally, and, I must say, with good results, although always, when it seems the cleft is narrow enough, I make an old-fashioned slit by keeping close to the lines of the proposed eruption of teeth rather than make a dissection from that line to the inner side of the cleft, before making any denudation on the cleft side. I can make that much easier when the field is not obscured by blood. Dr. Eastman makes the denudation on the inner side, freshen-

ing all of it before he does anything else. In that way we get a double source of hemorrhage.

In the number of operations I have done, I have used the tape once. Whenever I divide bone I make a wedge, push the gauze, covered with compound tincture of benzoin, down it, crowding the flaps together.

As to the use of iodoform: While there may not have been immediate union in some cases, I have never seen a patient poisoned on account of the iodoform used. The apparatus which Lane uses for chloroform anesthesia is a curved tube connected with a small bottle containing the chloroform and which is passed down through the nostril or around the curve of the tongue into the posterior pharynx. With the head of the child hanging over the head of the table the anesthetist can regulate the amount of fumes by the action of an old-fashioned bulb, which drives air over the top of the ether or chloroform, whichever anesthetic is used. I have noticed that the English people use chloroform without feeling badly about it.

Dr. W. W. Grant (Denver, Col.): I desire in this connection to report what was, to me, the most interesting and difficult case of the kind that I have ever seen, largely from the fact that this boy sixteen months ago was thirteen years of age and had never had any attempt made to close a complete cleft-palate and hare-lip. The case, I imagine, was something like the one narrated by Dr. Dunsmoor. The neighbors felt so sorry and got so tired of looking at him, they made up a purse and sent the boy to me. I found they had imposed on me a rather difficult task. It was impossible without seeing to appreciate the proboscis.

The right half of the upper maxilla stood out an inch or more in front of the left, and the cleft in the hard palate flattened out the nose. The two incisor teeth were absolutely transverse, so that you can imagine what a pitiable object he was. There was no connection between the upper maxillary bone, except through the bridge of the nose and nasal processes of the maxilla. I proceeded in this way: I first pulled out two incisor teeth, freshened the surface with bone-pliers and scissors, separated the upper lip freely completely around and pulled out the first bicuspid tooth, on the right, and with pliers and a bone-chisel broke the bone to the case of the nasal process. I divided the narrow hard palate on that side, and

after doing that I could, without much difficulty, bring down this right half to the left. I then found that this bone-flap was so loose, I was afraid the slightest movement would displace it. I wired it to the left, and to hold it in better position I put a loop of silver wire around the two front teeth, and with a needle threaded in each end carried it through the upper lip and tied over a mattress suture just beneath the nose; giving a little more stability to the flap. I united the palate and the bone operation, so that I got a good result in the hard palate, while the soft palate was a failure. I brought the lips together in the usual way. I performed preliminary tracheotomy before proceeding with this, in order to get free access to the mouth without too much interruption. In the course of three weeks, in order to lengthen the upper lip, I made two incisions obliquely upward and outward (the lip had united perfectly) from about the middle. I pulled the lip downward, put in a stitch, and elongated it fully half an inch. It was a simple piece of plastic work which united nicely. I got excellent union of both bone and soft parts, and in the course of six months permanent teeth had all come out. I kept the boy in Denver for two or three months because I performed two or three operations on him. One of the stockmen who brought the boy to me to be operated on told me that he was now singing in a choir and talking very well; and instead of being a repulsive object, and being laughed at by other school children, he is to-day a rather good-looking useful boy, although his soft palate is still ununited. I had a dentist put a plate in the boy's mouth but he said it did not feel good, so he took it out and threw it away.

The point of most interest in this case was the method of bringing down the jaw bone, which I have never heard of or seen before, but I felt it was worth undertaking.

DR. EASTMAN (closing the discussion): Bevelling on the nasal side is better if mattress sutures are to be used.

Dr. Grant's description of this case reminds me of several I have had, and no doubt every one present has been reminded of similar cases, not so extreme perhaps, where the premaxilla is attached at one side and tilted forward so as to be disconnected on the opposite side. It is remarkable how easily one often can chisel loose the

premaxilla sufficiently to spring it back into alignment and wire it in place after boring holes in the premaxilla and alveolus with a brad-awl.

PLASTIC SURGERY OF THE ABDOMINAL WALL

ROBERT C. COFFEY, M. D.

PORTLAND, OREGON

Abdominal hernia may be defined, in a general way, as a protrusion of the abdominal contents through the abdominal wall proper or beyond the ordinary plane of the abdominal wall. If the contents pass through an actual opening in the fascial wall (inguinal, femoral, umbilical, and post-operative or traumatic), the hernia may be said to be *absolute*. On the other hand, if a certain portion of the abdominal wall or fascia is weakened to such an extent as to allow protrusion of the contents of the abdomen without an actual opening in the fascial wall (diastasis recti), the hernia may be said to be *relative*. The principles for the treatment of absolute hernia are well established, while diastasis recti is well treated by Webster's method.

I wish to call attention to another form of relative hernia which occurs occasionally and is manifested by an increase in distance and a protrusion between the umbilicus and the anterior superior spinous process of the ilium, due to transverse stretching of the fascia of the external oblique. This condition may be unilateral or bilateral, as shown in the Figs. 1 and 2. When bilateral it may be classed under the head of *pendulous belly*, dwelt upon by Webster and others, but it is anatomically different in that it is external to the recti

muscles. This condition is treated as follows: First, split the fascia of the external oblique parallel to the fibers in such a manner as to converge with a like split on the opposite side at a point just above the symphisis; secondly, separate the fascia from the internal oblique; thirdly, draw one layer of the fascia under the other with quilt sutures of linen, taking care to have the loop of thread include the fibers of the fascia in a transverse direction (Fig. 3a); fourth, suture the remaining free edge of the fascia to the outer surface of the other layer with a continuous catgut suture to further improve the apposition at the free edge (Fig. 3b). Thus the distance between the umbilicus and the anterior superior spinous process has been diminished, the protrusion has been reduced, and the fascial wall has been doubled. The result is an abdominal supporter made of the patient's own tissues, and it may therefore be termed an autoplastic bandage. (Fig. 4a.) Two cases treated by this method, one unilateral and one bilateral, have been entirely successful. The one was performed eighteen months ago, and the other eight months ago.

EXPANSION OF THE UPPER PORTION OF THE ABDOMINAL CAVITY

This is indicated, first, when an incision for surgery of the upper abdominal cavity can be closed only with great difficulty and much tension; secondly, as an aid in the cure of post-operative hernia of the upper abdomen, notably that following gall-bladder operations in fat people, and, third, in cases where operation is indicated and performed for chronic prolapse of the liver and stomach, either producing or resulting from the narrowing of the upper segment of the abdomen. It is performed as follows: Split the anterior sheath of the recti an inch or more from the median incision and dissect off from the muscle toward the median line (Fig. 5); then bring the cut edges of the

Fig. 1. Relative left-sided hernia in an old woman.

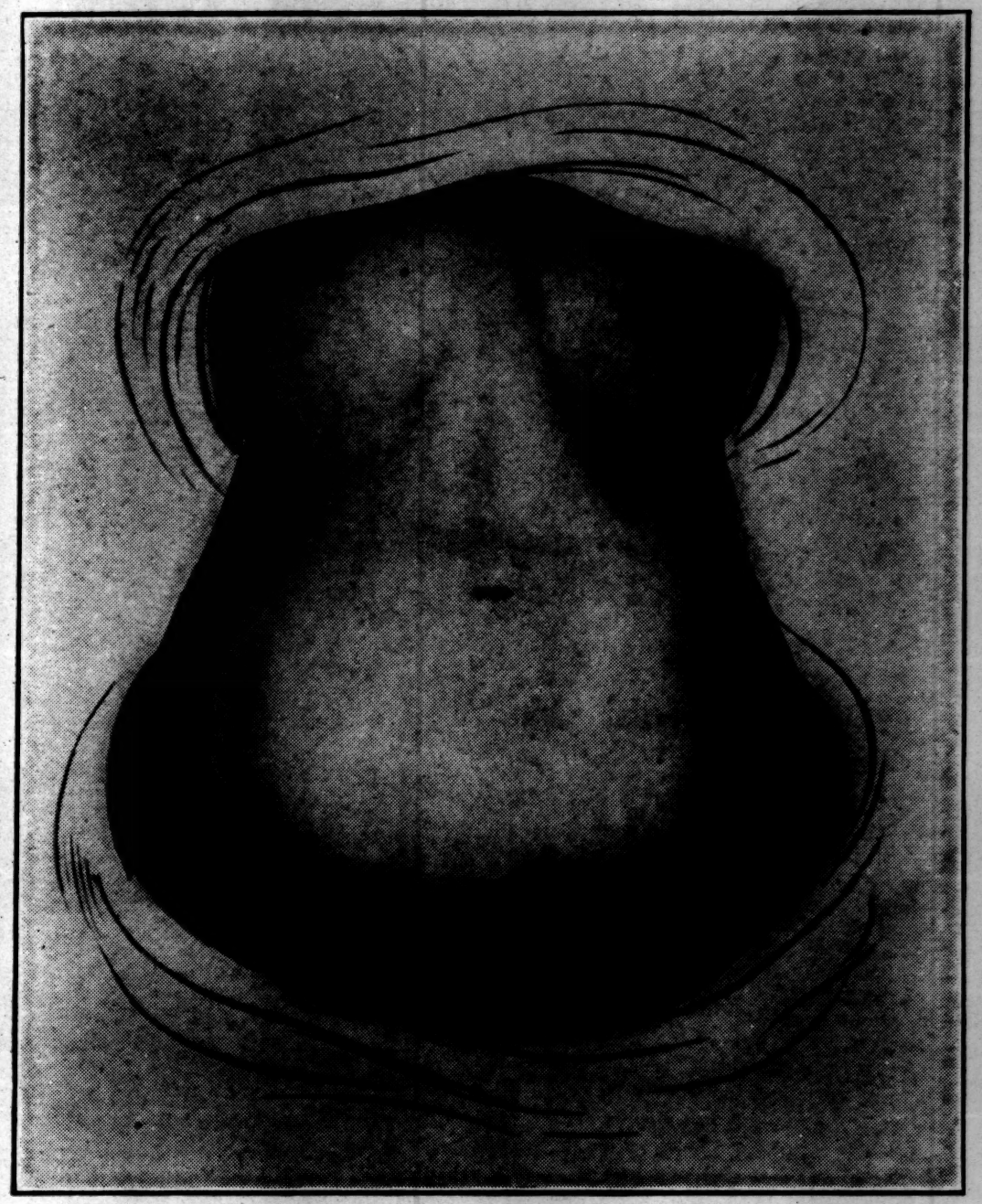

Fig. 2. Pendulous belly without diastasis recti, and contracted upper abdomen, relieved by expanding the upper abdomen and narrowing the lower by the combined operations shown in Fig. 4, B and A.

Fig. 3. Overlapping and doubling the fascia of the external oblique.

Fig. 4. A, Completed operation for narrowing the lower abdomen. B, Completed operation for expanding the upper abdomen.

fascial flaps and peritoneum together and suture in the median line, leaving the front surface of the recti muscles bare (Figs. 5 and 4b.) If the operation is being done to relieve tension in closing a wound already made at or near the outer edge of the rectus muscle, whether in doing a primary operation or in a hernia, a separate median incision is made down to and through the fascia to the peritoneal fat, but not opening the peritoneum at this point, and taking care to keep in the exact median line so as to avoid opening the sheath of either rectus muscle at this point. Then split the sheaths of the recti and turn in as just described. The upper abdomen may easily be expanded two or more inches by this method, after which an otherwise very difficult hernia at the outer border of the rectus may be closed with ease. I have performed this operation several times successfully on patients and experimentally on animals a greater number of times, and have had no subsequent hernia or adhesion of muscle to skin.

In this connection I would mention some experiments I have made on dogs, all of which are in accordance with the foregoing statements. In some dogs I have supplemented the operations shown in Fig. 4 by darning the fascia and muscle as shown in Fig. 6. The darning was done with large linen thread, with the idea of making a stronger abdominal wall after the removal of the front part of the sheath of the rectus. This experiment was entirely successful. The threads were completely imbedded in the tissues so that they were not discoverable to the naked eye on cross section. They gave no trouble in any case as far as coming away or suppuration was concerned. The skin did not become adherent to the sutures or to the muscles in any place. By palpation through the skin the indurated area surrounding each thread was easily felt. Where the muscle had been uncovered, as is

shown in Fig. 4, dense new tissue had formed, resembling a new fascia, but as it was necessary to kill the dogs two months after experiment, it was impossible to determine whether a true fascia would form or not. I may say, however, that fibrous tissue resembling a new fascia bridged the space across the uncovered muscle perfectly where no darning threads were used. I would therefore suggest that the darning across the gap is probably an unnecessary refinement in most cases, but that it may be well to know that it may be done with impunity in case it seems appropriate.

DISCUSSION

DR. D. S. FAIRCHILD (Des Moines, Iowa): Several years ago a brakeman, employed by a railroad company, was thrown off the car and got under the wheel in such a way that the left arm was crushed under the wheel, the car wheel going up over the abdomen, producing serious injury to the abdominal wall, and passing over the hip-bone so as to fracture it and drive it inward, bending it towards the median line, the injury producing a neuritis and resulting in complete atrophic changes in the muscles of that side of the abdomen. The muscles almost entirely disappeared, and the whole left side of the body was converted into one hernial sac, which made it difficult for him to get about and perform any duty. We concluded to shorten the abdominal wall on that side, and after doing two or three different operations we shortened that side nine inches. For three or four years he has been able to perform the duties of a traveling man.

This is the only experience I have had in that class of cases in which the abdominal wall was stretched out on account of atrophic changes in the muscles due to damage to the nerves, so that by using the fascia, sliding it in and stitching it down, we were able to shorten the abdomen nine inches in its circumference.

Fig. 5. Method of expanding the upper abdomen.

Fig. 6. Diagram to illustrate the method of quilting the abdominal wall with linen thread. (So far this has been used only on dogs.)

THE REPAIR OF THE INTERNAL RING IN OBLIQUE INGUINAL HERNIA

F. GREGORY CONNELL, M. D.

OSHKOSH, WISCONSIN

An understanding as to the various steps necessary in the repair of oblique inguinal hernia may be materially aided by a comparison of the relations of the normal structures with those in which a hernia exists. These are shown in the following table of parallel columns and Figs. 1, 2, 3 and 4.

	NORMAL	HERNIA
Parietal Peritoneum.	Smooth and even.	Outward bulging, forming the sac.
Internal Ring.	Snugly surrounds the cord.	Enlarged downward and inward, surrounds the cord and sac.
Internal oblique muscle.	Covers and protects the internal ring.	Does not cover, or only partially covers, the internal ring.
Inguinal Canal	Oblique, long, and narrow.	Less oblique, shorter, and wider.
External Ring.	Smaller and triangular.	Enlarged upward and round.

Radical operation for the cure of inguinal hernia should consist of an attempt to restore the various structures to their normal relations. In the majority of operative methods in vogue at present, no attempt is made to reproduce the anatomical relations, the result being an alleged improvement upon Nature, as is exemplified by the Bassini method. Synchronous with, and largely due to, the teachings of Ferguson, there has been an increased usage of operative procedures in which the anatomical relations are more

or less completely replaced, Nature being imitated in the attempt at cure.

The relationale of so doing has been well emphasized by various observers; for example, the removal of the *sac* at the neck with the redundant parietal peritoneum (Fig. 2) has been emphasized by many, but the etiological importance of a congenital sac as brought out by Mr. Hamilton Russell, of Melbourne, in his "Saccular Theory," is a most convincing argument in favor of this detail of the operative treatment.

The advisability of placing active, red muscle, the *internal oblique,* external to the internal ring, to act as a protection or check against the protrusion of viscera through the ring, we owe to Ferguson[2].

That the *inguinal canal* must be long and oblique so that with increased intra-abdominal pressure the walls of the canal will be held in more intimate apposition, and hernia be prevented by a valve-like action of the canal, was perhaps first emphasized by Marcy[3].

The necessity of the walls of the canal fitting snugly around the cord, has been met by the imbrication or double breasting of the walls as applied to inguinal hernia by Andrews[4].

The attempt to secure a strong and small *external ring* was a part of, and in some instances the entire aim of, some of the early and incomplete forms of operation. The strength of the external ring has of late been assured by the incision of Mayo[5], which allows the preservation of the intercolumnar fibres of the external oblique.

A new internal ring is made in the majority of the operations now employed. But in an anatomic operation the original internal ring should be repaired, i. e., (a) made smaller of suitable size to properly surround the cord after the removal of the sac,

Fig. 1. Front view, inguinal region; normal relations, showing through an opening in the aponeurosis of the external oblique muscle, the size and position of the internal ring, lying behind the internal oblique muscle.

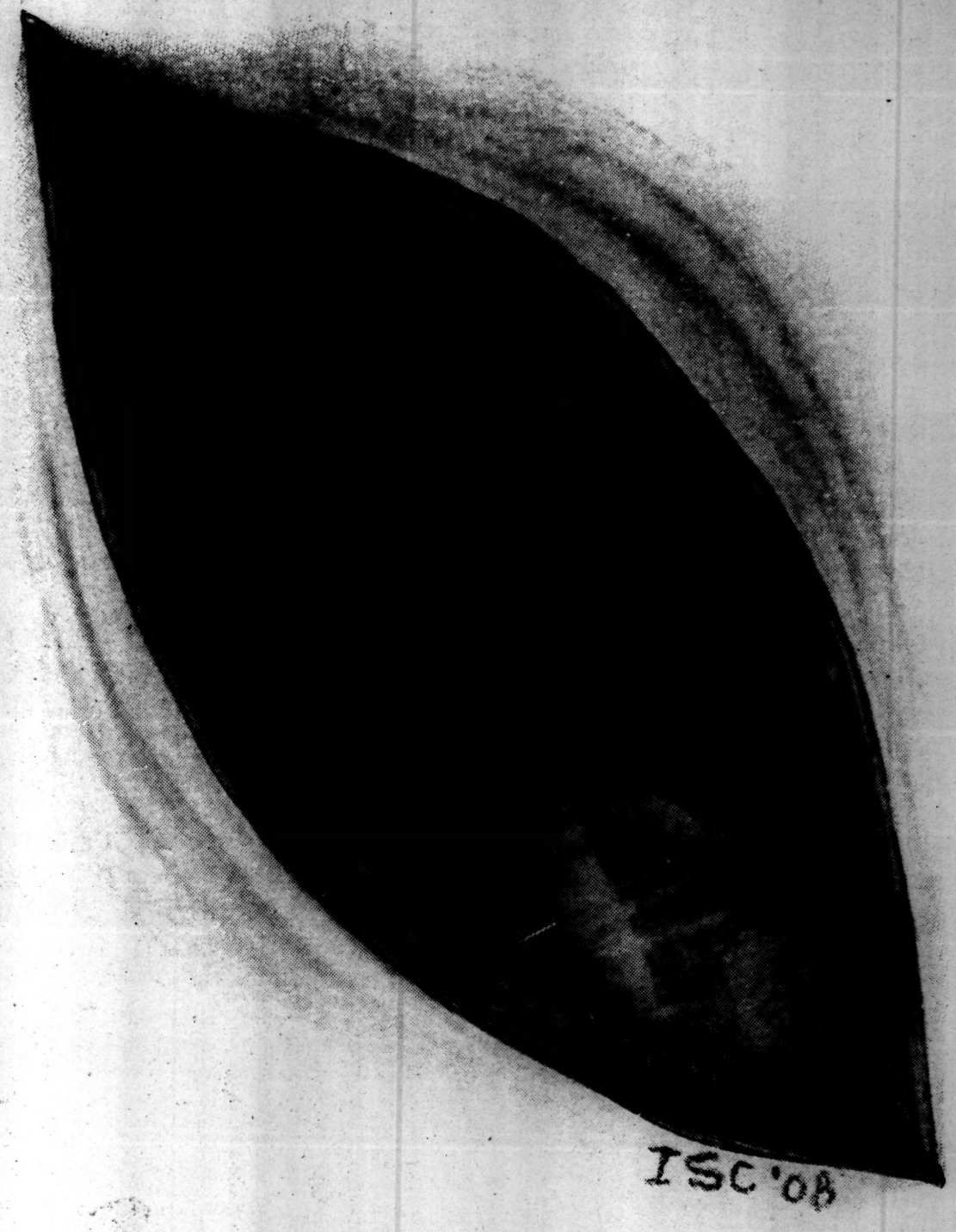

Fig. 3. Front view, inguinal region, with oblique inguinal hernia, showing, through an opening in the aponeurosis of the external oblique muscle, the elevation of the internal oblique muscle; the dilatation and descent of the internal ring, with sac covering the cord and presenting at the dilated external ring.

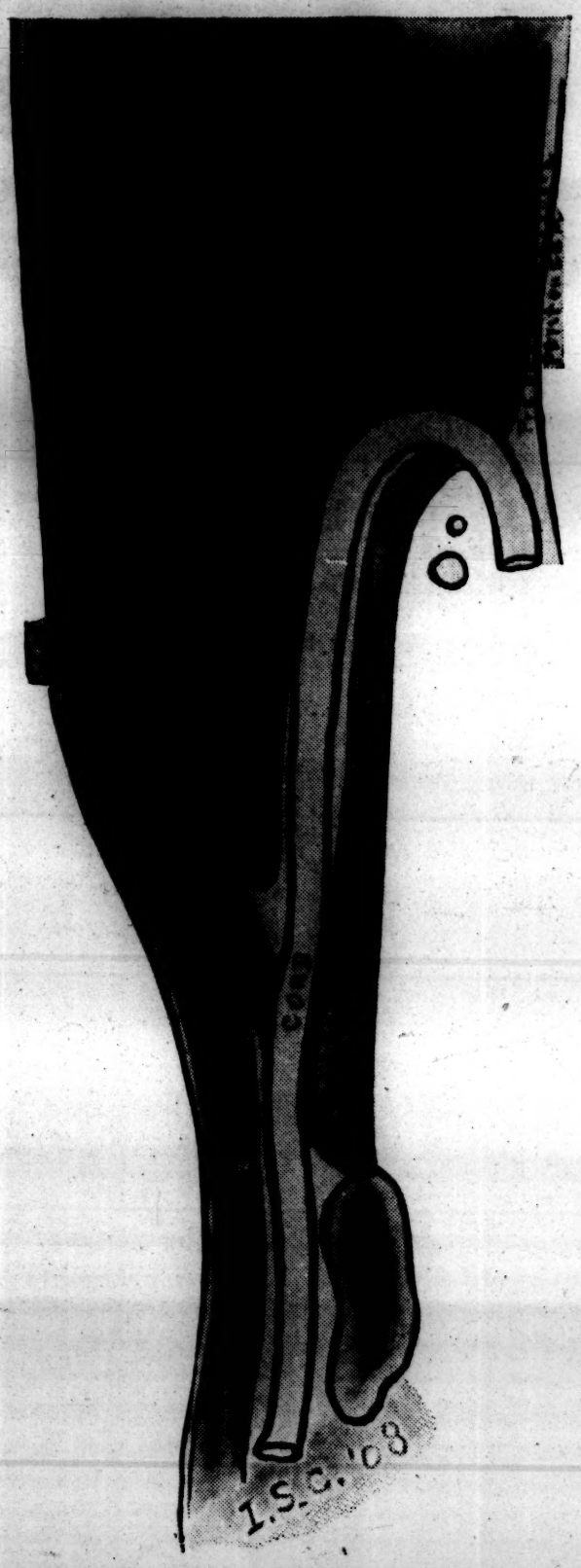

Fig. 2. Sectional drawing of the relations in Fig. 1, showing the parietal peritoneum, smooth; the internal ring small and the surrounding cord; the internal oblique muscle covering the internal ring; the inguinal canal oblique, long, and narrow.

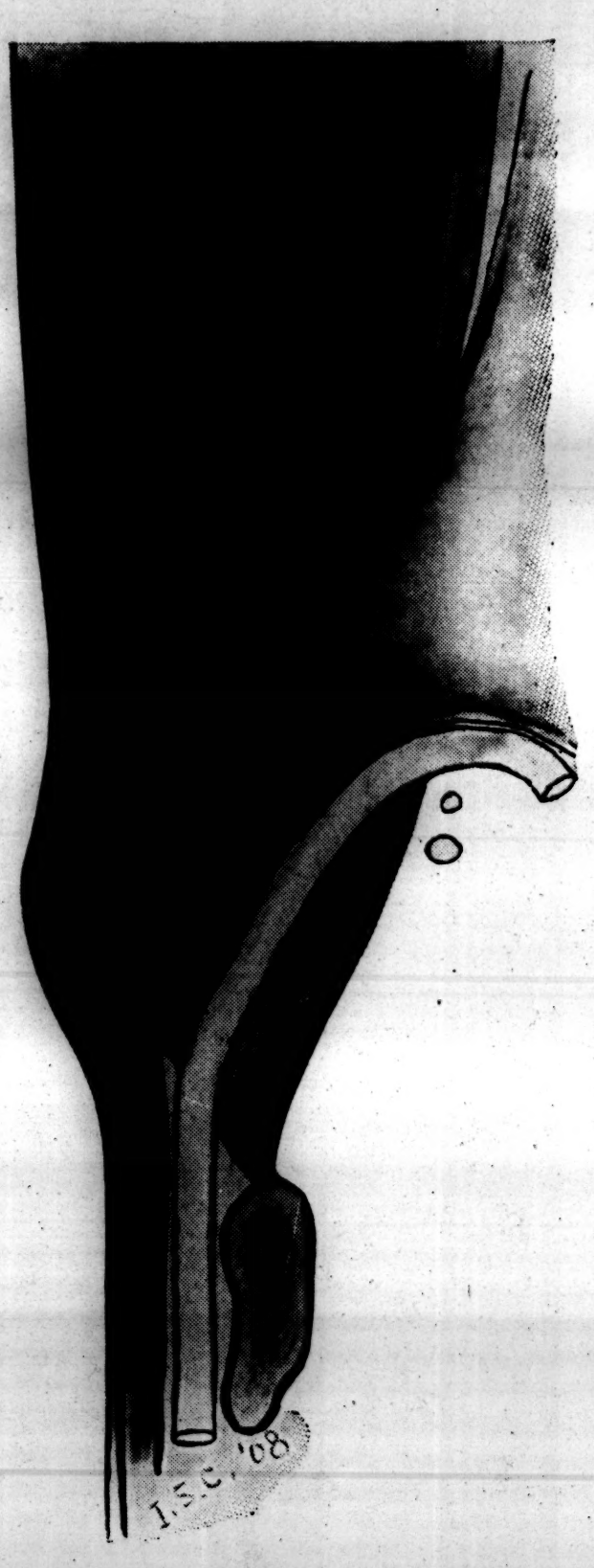

Fig. 4. Sectional drawing of relations in Fig. 3, showing parietal peritoneum bulging outward forming a sac; internal ring enlarged downward, surrounding the cord and sac; internal oblique muscle elevated above the internal ring; inguinal canal less oblique, short, and wide.

and, of equal importance, (b) replaced to its normal position in proper relation with the inguinal canal and the external ring.

The internal ring may be diminished in size by suture of the transversalis fascia, either above or below the opening for the passage of the cord.

The suturing of the transversalis fascia from below upward, that is, beneath the cord, was first performed in 1878 by H. O. Marcy[6].

This detail was likewise a step in the "combination operation" reported by Ferguson[7] in 1895.

But in the "Typic or Anatomic Operation," published by Ferguson in 1899, all of the structures are replaced to their normal anatomic relations, with the single exception of the internal ring, which is depressed because of the advice, that the internal ring be strengthened, "with a few stitches *above* the root of the cord[8]." (Fig. 5.)

From inquiry and from observation I am led to believe that in many so-called Ferguson operations this detail, the minimizing of the internal ring, is often omitted, which in part accounts for recurrence where this does not occur.

When these stitches are placed above the cord, only one of the essentials for the repair of the ring is fulfilled, that is, the ring is made smaller. The lower and inner margin of the dilated ring, which is the most abnormal and displaced portion of the circumference, is used as the fixed margin; while the upper, the normal superior boundary, is brought together and displaced downward. In this way the ring while being made smaller is, at the same time, depressed. (Fig. 6.)

So it would seem that diminution in the size of the internal ring by suture of the transversalis above the cord does not constitute proper repair. While mere diminution in caliber is an important step, it

seems the results would be still better if the ring were elevated to its normal position and relation at the same time that it is made smaller. And this is accomplished by placing the stitches beneath the cord, which pleat and reinforce the abnormally dilated and attenuated lower margin, while the superior margin, that portion of the ring that has not been stretched, dilated, and displaced by the protrusion of the sac, is not interfered with but is used as the fixed margin.

The necessary stitches in the transversalis fascia, preferably of the mattress type, may be inserted and tied, in such a manner that the cord is not extensively separated from its attachments, and the knot may be placed to one side so that they will not irritate the cord[9]. As a result the upper margins of a repaired and a normal ring are in the same relative position, which is at the proper distance above and external to the outlet of the canal.

This apparently trivial difference in the manner of repairing the internal ring will, with a study of the subject, be found to be of the utmost importance regarding the length and obliquity of the resulting inguinal canal.

Ferguson has so forcibly and ably impressed the importance of placing the internal oblique muscle external to the ring, that the value of a small and normal ring has been comparatively overlooked. These two factors are mutually beneficial, the higher the internal ring and the lower the internal oblique muscle, the more effectual will be the prevention of recurrence. (Fig. 1 and 2.)

The reason that the internal ring has not been elevated, as well as made smaller, by stitches placed beneath the cord, is the fear of a possible traumatism to the cord, which might cause interference with the nutrition and function of the testicle.

The question, "Is the Transplantation of the Cord

Fig. 5. Repair of the internal ring. (From Ferguson.)

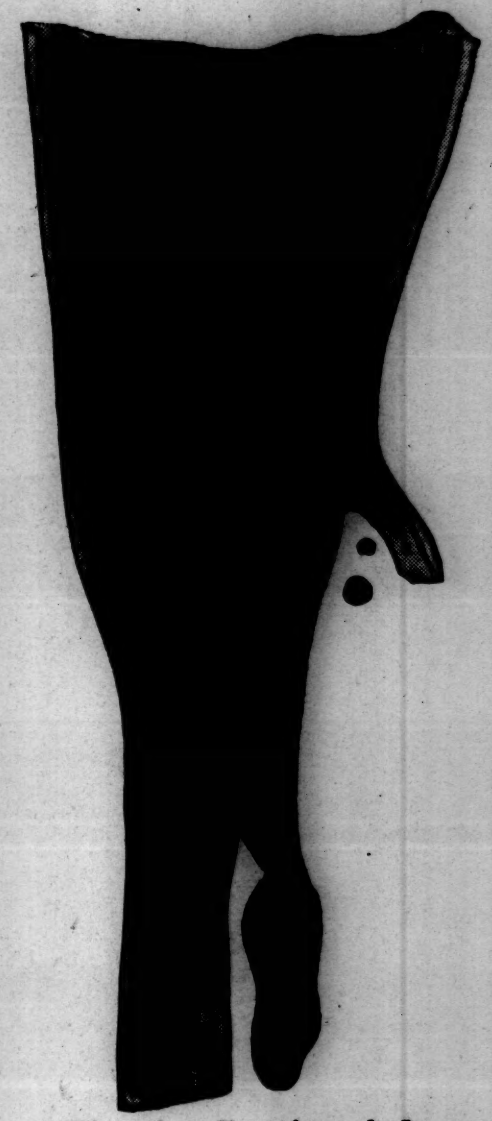

Fig. 6. Sectional drawing of the relations in Fig. 5, showing the descent of the internal ring.

Necessary in the Radical Cure of Inguinal Hernia?" I have previously discussed[9].

Repair of the internal ring with a consequent elevation of the cord to its *normal* position, can hardly be considered a transplantation of that structure.

In conclusion, I would emphasize the repair of the internal ring, by suture of the transversalis fascia beneath the cord, which causes both minimization and elevation of that structure.

With the attachment of the internal oblique muscle to the outer two-thirds of Poupart's ligament, so that it covers and protects the repaired internal ring.

The above details causing a relationship which results in a valve-like formation of the inguinal canal which is important in preventing recurrence.

These steps should be preceded by the removal of the sac at its neck, with the redundant parietal peritoneum, followed by the reunion of the divided external oblique aponeurosis, and the formation of a suitable external ring.

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DISCUSSION

Dr. Arthur T. Mann (Minneapolis, Minn.): This is too good a paper to let go without discussion. As the result of some recent work I have been able to follow twenty dissections of the inguinal region, and the transversalis fascia has only approached toughness in one case. Usually in the cadaver it has been about the thickness and strength of twice the peritoneum in the same person. Once it was as strong as the conjoined tendon, which was weak in that special case. In that same patient the cremasteric fascia was as strong as the conjoined tendon.

I have seen that only once before, and that was in a case I operated on yesterday morning, in which both conditions were the same as just stated. It is a very valuable suggestion to close the transversalis fascia. The internal ring is really the opening in the transversalis fascia, anatomically.

With regard to the Ferguson or the old Wolfer operation: I think Wolfer of Prague reported his cases four years before Ferguson did, making the cord come out at the level of the external ring. This is probably wrong for this reason: It is inelastic tissue which is pulled upon and the forces pull upon the circle of the ring in practically all directions tending to stretch it wider, hence the moderate tendency to recurrence of the hernia at this opening. In the ordinary Bassini and its modifications the internal ring is guarded by slit-through muscle bundles, which tends to close when the abdominal muscles are brought into play. This must act as an important factor in preventing recurrences.

So far as the statistics of recurrences go, they are not quite so good for the Wolfer or Ferguson operation as for the operation which restores the canal, such as the Bassini or some modification of the Bassini operation.

I have for the last two years had a little modification of my own on this Bassini operation which I can illustrate in a minute or so. The cord is lifted up in the final operation, so that I will draw it there (indicating); the internal ring is closed in any way you please. The aponeurosis of the external oblique is cut so that the lower flap shall be about three quarters of an inch wide, and this is nicely held together by the inner bundles of the arcuate fibers, which, as a rule, constitute a firm band in old hernias. This lower flap is folded upwards over the first line of stitches onto the internal oblique and its tendon and reaching across onto the sheath of the rectus, and it is sutured into place beneath the cord as far as the internal ring. Two or three stitches are now taken through the flap to fasten it to the internal oblique muscle across the lower or inner margin of the slit in the muscle which has been left as an internal ring. This last procedure gives additional strength at the internal ring; the first procedure of course adds the strength of the flap to the deep suture-line. The upper portion of the flap is sutured over the cord in the most convenient way, com-

pleting an operation, which still preserves the indirect canal for the cord.

DR. JOSEPH RILUS EASTMAN (Indianapolis, Ind.): Just a minute to express my surprise at Dr. Mann's statement to the effect that the statistics for recurrence are worse since the general adoption of what is known as the Ferguson method. The fact is, Bassini himself now does the operation which we ascribe to Ferguson in this country, but which Dr. Mann has called the Wolfler method, and which in Europe is credited to Girard of Geneva, who is said to have devised the method before Ferguson. It is difficult to understand Bassini's action in giving up the practice of displacing the cord and adopting the method of Girard unless this represented improvement over the classical Italian method, which made Bassini so famous.

DR. DANIEL N. EISENDRATH (Chicago): There was one statement made which I would not like to see go unchallenged, namely, that by Dr. Eastman, that Girard is the predecessor of Ferguson in this transplantation of the muscles in front of the cord. Some four or five years ago I had occasion to look up the literature in regard to this subject in connection with the presentation of a paper before the American Medical Association, and I found that Ferguson published his article in the Journal of the American Medical Association almost simultaneously with Girard's contribution, which appeared in the Archives Provinciale Chirurgie. So it seemed clear to us that the method had been suggested by both men simultaneously.

With regard to the operation proposed by Dr. Connell: We have had a number of warm discussions at the meetings of the Chicago Medical Society on this point, and it seems to me the point has been aptly stated by Dr. Mann, who, in twenty cadavers, found only two in which the transversalis fascia in that portion of the abdomen was more than twice as thick as the peritoneum. And that has been my own experience. I have looked in vain for transversalis fascia sufficiently thick to put sutures into which I could feel did any good. That is the practical point I want to make.

There is another point which, I think, ought to be brought out in this connection, namely, we ought not to operate on a hernial sac unless we have followed it into the point where it turns into the peritoneum. It has hap-

pened to a number of us to encounter pantaloon sacs. I had occasion to see one in the last month at the Cook County Hospital. These are cases in which there are double sacs, frequently associated with lipomata, and unless we follow them closely up to the internal ring, ligating one sac at this point (indicating on blackboard), in a few weeks there will be a recurrence. Dr. Bevan reported one case where within three weeks after he operated the patient had a recurrence. He found it was precisely like that of a pantaloon sac. I have encountered this variety of sac in three cases within a year.

Dr. A. E. Benjamin (Minneapolis, Minn): I want to say a few words on this subject. I think all the statements that have been made by Drs. Connell, Mann, and Eisendrath are correct, so far as the transversalis fascia is concerned. Dr. Ferguson has called attention to the fact that we can substitute some of the fibers of the rectus muscle, or take the transversalis muscle and the internal oblique and pull them down underneath the external oblique, and we have the cord coming out in this manner (indicating on the blackboard). In about half of my cases I do the Ferguson operation, and in the other half the Bassini operation, according to whether the cord is large or small. In case the cord is large, it is well not to transplant it. I pass my sutures, beginning beneath the transversalis, in this manner (indicating), passing through Poupart's, and bringing them out through the skin; and the second end of the sutures is passed in a like manner. The advantage of this is, as you know, you have a thin external oblique or Poupart's ligament, and if you make a mattress suture parallel with the fibers, it will cut through. Tension on the sutures may pull it through; consequently I have used a roll of gauze on the skin and tied the sutures over it. This has been satisfactory. I do not like to use any other material for the sutures than silk-worm gut, since that has been so satisfactory, and I have been able to get patients up on the second or third day.

I read a paper on this subject before our state medical society this fall so that the Minnesota men are acquainted with this method. If you can get patients out of bed early and perfect union has been effected, a great many more of them will be operated on. To close this (indicating), we bring the external oblique fibers and Pou-

part's ligament together, overlap them in this manner (illustrating), either by a continuous suture of fine catgut or interrupted suture. But the former suture will suffice, so that you have an imbrication or overlapping of the tissues. There has never been a recurrence of my cases so operated on.

DR. W. W. GRANT (Denver, Col.): I am a little surprised that no one has alluded to the method of Kocher in reference to the disposition of the sac. Kocher says, if you will dissect the sac from around the internal ring well, and then make a short incision, about three quarters of an inch, to the outer side and a little above the internal ring, even through into the peritoneal cavity, run a forceps through into the internal ring, and pull the sac through the ring, stitch it unto the muscles, and close it, it does not make much difference about the details of reconstructing the canal. You have changed the matter of gravity in reference to the contents of the abdomen, you have destroyed the pouch, and you are not likely to have a recurrence. I have been using this method for several years and have never had a recurrence, though using the Bassini, as to the canal, in most details.

DR. CONNELL (closing the discussion): With reference to the matter of priority: I have had occasion to look up the history of hernia in regard to the Ferguson operation, and there is no question but what Ferguson preceded Girard by a very short time. There is this difference between the Girard and the Ferguson operation: Girard imbricates the external aponeurosis, while Ferguson does not. The Ferguson-Andrews operation is analogous to the Girard operation. Again, Bull and Coley claim priority both for themselves and for Woller. Coley and Bull reported some cases of the Bassini operation in which they did not transplant the cord before Ferguson reported his method. Of course, an operation which does not transplant the cord is not a Bassini operation. The principles involved are entirely different. Ferguson has dwelt upon and taught the advantages of bringing the internal oblique muscle, the red, active, strong muscle of the abdominal wall in the inguinal region, external to the internal ring. That is what Ferguson has emphasized, and he should receive credit for it.

In regard to the strength of the transversalis fascia

in oblique inguinal hernia: It makes no difference how strong or weak it is, the reason for suturing the transversalis fascia is to elevate the ring and the cord and to make the canal oblique. The strength of the canal is in the active red muscle, which is external, anterior, in the internal oblique muscle.

There is one point of distinction which must be emphasized, namely, to differentiate between direct and indirect inguinal hernia. The direct hernia is simply a ventral hernia which presents through the external ring, and in its repair different principles are involved.

As to the pantaloon sac: It was for the purpose of detecting such secondary diverticula that I placed great emphasis on the removing with the neck of the sac the redundant parietal peritoneum. By pulling up on the neck of the sac where it opens into the peritoneal cavity, you will not overlook a second sac. I have had in the past year one case which was analogous to that reported by Dr. Bevan, in Surgery, Gynecology, and Obstetrics, November, 1908, and the case of Dr. Eisendrath. The patient came back in a little less than a year with a recurrence, and examination disclosed a second sac. Including parietal peritoneum with the neck of sac, taking care not to bring bladder, cecum or sigmoid into the suture line, will probably prevent such oversights.

As to the Kocher operation: I can see no advantage in placing the sac as a foreign body in the abdominal wall. The sac should be removed. While the sac is occluded, the internal ring is not repaired or protected by red muscle, and the cord is not elevated at the internal ring.

SURGICAL TYPES OF ABDOMINAL TUBERCULOSIS

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Abdominal tuberculosis is not a clinical entity: it is a generic term embracing many forms of disease which may occur in the abdominal cavity. It is frequently impossible to tell which organ is affected, and the term therefore covers the general symptom-group.

The intestines and pelvic organs and peritoneum are the strongholds of the disease.

The duodenum, like the esophagus, is peculiarly immune to tuberculosis, which is due to the rapid passage of the contents through these tubes, allowing no opportunity for microbial fixation. The stomach also appears to have an immunity, which is due to the fairly certain destructive influences of the gastric juices upon the T. B. as upon other microörganisms. Simmons found only eight instances of tuberculosis of the stomach in two thousand autopsies on tuberculous subjects. That it may be primary in the stomach, however, is shown by Winternitz, who found nine instances in the literature, with no involvement of the lung, and fifty-seven cases of secondary involvement. Tuberculosis of the small intestine is usually secondary, but it has been found to occur primarily much oftener than was formerly believed. Experiments have proven that the bacilli may enter through the

mucosa into the mesenteric glands and leave no demonstrable lesion to betoken its passage. Some pathologists claim that twenty-five per cent of tuberculosis gains entrance into the system through the intestinal mucosa. Revenai collected four hundred and thirty-three cases of primarily tuberculosis of the intestines.

This disease when limited to the small intestine, is notoriously a disorder of child-life and gains its largest proportion when the transition of the mother's milk to cow's milk is made and mixed feeding with increased opportunity for infection is begun. Even in adult life, excluding the eighty per cent of cases which gain entrance through the lungs, Mayo believes that the use of uncooked milk and infected food causes the larger proportion of intestinal and abdominal types in rural communities. Pulmonary tuberculosis in cities is relatively more frequent than abdominal, which is partly due to the restricted use of uncooked milk as a food.

That portion of the intestine which abounds in lymphoid tissue (Peyer's patches) is attacked. The tubercle bacilli have a special predilection for these tissues in the lower ileum, cecum, and appendix where they lie immediately underneath the vulnerable mucosa. Invasion is invited mechanically by the slowing up of the fecal stream at this point. In the cecum it amounts to stagnation, and the resulting infection is easy.

In the small intestine its advent is marked by chronic, persistent, intermittent, or griping pains and bloody diarrhea, with emaciation and tenderness over the seat of ulceration.

It is the sequellæ, however, such as strictures adhesions and bands, and the development of peritonitis in childhood that are of surgical moment. The mechanical results mostly demand surgical interference. There are many sequellæ, such as mixed infection and

occasionally fatal hemorrhage from stricture or from hyperplastic proliferation; and generalized tubercular peritonitis or localized peritonitis, with effusion, abscess and fistula. There is also a rapid spread of miliary tuberculosis and also perforation with all its dangers. Nikoljske, quoted by Connell, found that forty-two per cent of intestinal stenosis was caused by tuberculosis.

In view of these immediate and remote results, many of which, especially stricture, are almost inevitable, would it not be wise to subject certain of these localized tubercular ulcers to excision?

Stricture rarely presents the dramatically acute picture of ileus, but the chronic and recurrent manifestations of vomiting, pain, flatulency, and intermittent diarrhea, with loss of strength and weight. The abdomen presents the "ladder-like" appearance, with visible peristalsis. The results of surgical intervention are, on the whole, quite gratifying on account of the chronicity. Intestinal resection is clearly indicated for the stricture due to ulcer in the small intestine. In the hyperplastic variety extirpation may be out of the question on account of its extent, and circuiting is a fair substitute.

The obstructive symptoms in this class of cases may abate and then recur. I have seen such a case in a man thirty-two years of age whose sister died of phthisis. He presented the history of abdominal pain, with temporary obstruction, associated with slight fever, abdominal tenderness, distention, and free fluid. He had a history of chronic enteritis as a child. He was urged to have operation but deferred it some weeks, at which time his obstruction became complete, and after it had been in existence over three days operation disclosed an exceedingly large hyperplastic deposit embracing a number of coils of the lower ileum. In his extreme state resection was not to be

considered, and a temporary ileostomy was done, but the patient survived only two days. He ran the same formidable risks that attend acute obstruction. There were grave anemia and a woeful lack of resistance. This could have been anticipated by a timely operation for what seemed to be not an urgent matter.

Tuberculosis of the ileocecal region is the most frequent site in the alimentary tract. Its localization there is so common and distinct as to be dignified with the distinctive term *ileocecal* disease. Conrath, quoted by Maylard, says this region is the site of election in about eighty-five per cent of all cases. The cecum has an abundance of lymphoid structures, is prone to frequent catarrhal conditions, and internal trauma, and also has the normal stagnation of contents at this point, which predisposes to the fixation and invasion of microörganisms. It may be, and often is, the primary atrium. It occurs most frequently between twenty and forty years of age. Sixty per cent (53 out of 81 cases), according to Crider, occur between those years. Aside from its frequent primary location, swallowed bacteria from pulmonary infection cause the cecum to be the most frequent secondary site.

In addition to the ulcerative and hyperplastic types we have in this region an inflammatory form due to mixed infection, often resulting in abscess. I have had two examples of this process in the last year. One occurred in a young man, who after an illness of ten days simulating mild appendicitis, with temperature, presented a tumor in the right iliac fossa that was not brawny like a ten day appendicular abscess, nor was it as tender. The condition did not abate while under observation for five or six days, although the mass was not so perceptible, and it decreased under refrigeration. His condition was not urgent, but the continuous temperature and the possibility of tuber-

culosis determined operation. There was a considerable amount of granulation-tissue, which was walled in by a chronic abscess. The cecum was mobilized, and the appendix, which had been implicated in the process, was removed. There was considerable hemorrhage from the raw surface and it was so profuse that it could be controlled only by a large gauze pack, which remained for some days. A fecal fistula occurred on the third day, which, contrary to expectation, healed in three weeks. The process seemed to have expended itself in the inflammatory termination. The patient reacted positively to the first diagnostic dose of tuberculin. He has gained weight and strength and is well after six months.

A similar case occurred in an elderly man with a tumor in the right iliac fossa, although it did not present as much of a granulation cavity, but more glandular enlargement, which was removed with the appendix and a portion of the head of the cecum. His sickness had lasted only about three weeks before operation. He gave a positive tubercular reaction and recovered without incident.

Berard and Patel claim that there is no spontaneous cure of hyperplastic tuberculosis of the cecum, and that it is invariably fatal. I performed resection of the ileocecal junction for a perpendicular sausage-like induration in a man twenty-seven years of age, which had been in existence about six weeks. He had chronic symptoms of obstruction with emaciation, alternating diarrhea, and occasionally great pain. Implantation of the divided end of the ileum into the site of the cecum with a Murphy button gave a satisfactory surgical restoration and allowed free exsection of the diseased structure. The patient made an excellent primary recovery. The operation may be exceedingly simple and vary in difficulty up to the impossible. This depends entirely upon the degree of fixation and

the length and multiplicity of the foci. Cases not amenable to resection give fairly satisfactory results from intestinal exclusion. Short-circuiting between the ileum and the colon by lateral implantation and suture seem best.

Mild symptoms of appendicitis in a man of seventy-five with a history of two preceding mild attacks led to operation as an interval case, and a considerable mass at the head of the cecum with the glands of the meso-appendix was seen to be tubercular. A partial resection of the cecum, together with the appendix, relieved him of his slight symptoms, and he remains well at the end of a year under constant medical supervision with continuous tubercular immunization.

In a twelve-year-old boy with hernia a hard mass the size of a cherry was found in the sac and regarded as omentum. Upon operation it was found to be tubercular. The incision was prolonged upward for two or three inches, and the entire omentum was found to be studded with tubercles and was removed by ligation almost at the transverse colon. The appendix was suspicious and proved to be tubercular upon histological examination. There was little free fluid. The boy made a pleasing recovery and is able to work as a messenger boy.

Tuberculosis of the appendix apart from the disease of the cecum, is quite rare. Oviatt and Connell found only one example of primary tuberculosis in three hundred appendices examined histologically. Lockwood, however, claims that two per cent of appendicitis are tubercular.

TUBERCULAR PERITONITIS

It is less than a century since tuberculosis was recognized by Louis as being the explanation of most cases of chronic peritonitis. König, about twenty-five years ago, was the first to regard it as being amenable

to surgical treatment. Sir Spencer Wells, in 1862, operated for a localized collection of fluid under the supposition that it was an ovarian cyst, and thus he, unwittingly, laid the foundation for the many cures which have been accomplished since in similar cases of localized tubercular peritonitis. They have been variously diagnosed as tumors of the omentum, mesentery, floating kidney, hydronephrosis and pyonephrosis. Cummings, out of 3,504 autopsies found tuberculosis of the peritoneum 92 times, or 2.7 per cent of the total number. Of these eleven per cent had tubercular peritonitis. About sixteen per cent of tubercular bodies at autopsy in another series showed tubercular peritonitis. The proportion of males to females was two to one. Forty per cent occurred between the ages of twenty and forty years. Of 5,608 intraperitoneal operations performed by the Mayos three per cent were for some form of intraperitoneal tuberculosis. Post-mortem statistics give a larger percentage to males, but operating-table statistics show four times as many females as males, which is accounted for by the frequency with which tubercular peritonitis is associated with infection originating or flourishing in the Fallopian tubes. This reason, and the fact that more women are subjected to abdominal section than men, may account for this proportion in the ratio, but Guildjides, after analyzing both post-mortem and operative statistics, concludes that the disease is *de facto* more frequent in women. In children the proportion is about equal between the sexes.

Young patients with dropsy and slight abdominal symptoms usually have this condition, and it should also be thought of in any doubtful case.

There has been much controversy as to whether tubal tuberculosis is primary and causative or the result of tubercular peritonitis. The surgical side holds the former theory, but even if the latter were true

the surgical dictum, that any focus which is a harbor or purveyor of infection, should be removed, is sound. Against the gravity or descending theory is the unanswerable fact that the greatest peritoneal involvement is closest to the tubes or the infected focus, which thus confesses its guilt. If ascending infection by the lymph route from the vas causes tubercular peritonitis in the male, why may not the same thing be caused in the female through an avenue that is very much more prone to invasion?

In the patients failing to improve after a reasonable attempt at general management, an exploration should be made. On opening the abdomen in any case where there is no acute or malignant obstruction and clear serum escapes at the incision, tubercular peritonitis is the most probable explanation. Next to the lungs and intestines the pelvic organs are the most frequently infected structures. Williams found 7.7 per cent of tubes removed for inflammatory process to be tubercular; Penrose and Beyea found 17.3 per cent.

Simple laparotomy in the eighties and early nineties cured a certain proportion of the ascitic variety. This was variously attributed to the admission of the air and sunlight, drainage, irrigation, to antiseptics, etc. There were collected about twenty theories to explain this result. Murphy, in 1904, showed that if the communication between the peritoneum and the source of supply be cut off a cure would ensue, as if the focus was actually removed. In the presence of ascites the tube floats in fluid in the peritoneum, like a bell-clapper, but simple removal of the fluid allowed it to come in contact with a serous surface, and the fibrous formation caused encapsulation and obliteration of the process. If this fortunate circumstance did not occur the cases would relapse, and while we were acting upon the simple incision theory and the sunlight and air idea many of those cases were subjected to

laparotomies six or eight times. Some were finally cured, but it remained for Mayo to systematically trace up his own cases that relapsed and upon secondary operation to actually remove the diseased tubes and thus establish, in connection with Murphy's epoch-marking work the present conception of radical removal of the actual focus of infection.

It has long been known that the ascitic type was the best and most favorable variety. Of twenty-six radical tubal operations made by the Mayos on cases of tubercular peritonitis twenty-five recovered permanently. Of these seven had been operated on for simple laparotomy for from one to four times previously.

Surgeons learned that the ulcerative and fibrous forms were most forbidding. Billing said that operation upon this class of patients was signing their death certificate, although Aldibert reported fifteen per cent of cures, with a mortality-rate of forty per cent.

In our efforts to do more than simple exploration in these diseased cases fecal fistulæ sometimes resulted, which added greatly to the miseries of the disease, and they rarely ever closed. The reason why opening the peritoneum did not benefit the fibrous type of cases as did the ascitic variety was, that we were really not opening into the free peritoneal cavity at all, but into a walled-in space, which, while it was nature's ineffectual effort to cure the disease, was in no wise benefited by operation, unless it was possible to remove the focus. This is sometimes accomplished with the greatest difficulty. Mayo says he had had to trace the round ligament from the abdominal wall, in order to locate the adnexial structures that were welded together in the pelvis.

Encouraged by the results in localized collections of a chronic character, we extend our efforts at relief to the infections which have run a course of four

or five weeks under medical management with perhaps a record of typhoid fever, or the gradual development of an abdominal tumor which has drawn the surgeon into the case, but most efforts at operation in these cases of mixed infection have been futile. I personally have never been able to cure a suppurating type and have found operation unavailing in some six or eight cases. I have opened them from above and below. I have operated on them secondarily for the removal of the gross pathological conditions, after primary incision and drainage had been done. They are all dead.

The acute type of peritonitis is most prone to be taken for an acute appendicitis. We are indebted to Lund for a faithful protrayal of the surgical findings in the cases of acute tubercular peritonitis, before the tubercles themselves appear, which he operated upon for acute appendicitis. He thus describes the conditions: "A thickening edema and dull purplish congestion, with dark-greenish fluid, were the conditions, only a very little fibrin in small, dark, yellow, soft, translucent flakes being present, and that in the bottom of the pelvis, where about the openings of the Fallopian tubes was the starting-point of the disease. The difference between this and the bright-red congestion, seropurulent fluid, and often abundant opaque fibrin of an acute septic appendicitis was notable."

The subacute cases come on slowly with abdominal tenderness, tympany, and low or continuous temperature, and, as above stated, they simulated typhoid, which can be excluded by the Widal reaction and tuberculin.

The chronic cases with symptoms of intestinal derangement, slow temperature, and abdominal discomfort with tympany, are often associated with exudate or tumor formation. It may be sacculated in the middle over the abdomen or in the pelvic cavity. Some-

times the fluid is sealed in the lesser cavity of the peritoneum by agglutination of the foramen of Winslow, and a smooth, fluctuant, globular tumor appears in the epigastrium.

The most constant tumor formation is a thickened, rolled up sausage-shaped mass lying somewhat transversely at the level of the umbilicus, which is the contracted omentum.

The diagnosis in these cases shows in from thirty to seventy per cent of the cases a family history of tuberculosis; and other tubercular lesions may exist in other serous sacs, in the pelvis, or in the epididymis. Effusion with multiple masses is very significant of tubercle where malignancy can be excluded.

In doubtful cases I must attest to the very great satisfaction which the diagnostic tuberculin has afforded me. I regard it as being almost as pathognomonic as any of the clinical data which we have learned to depend upon. I begin with one dose, and if at the end of three days no localized reddish reaction has occurred I administer a second dose, and if this is not positive I give the third dose.

So far as the medical treatment of this disease is concerned there may have been some truth in the contention that about half of them were benefited, if not cured, by medical means before we recognized the importance of ascertaining, if possible, and removing the causative pathological condition. At the present time the contention has very little weight, and at best I think the advice of Shattuck is sound, that if the patient under a month or six weeks of medical treatment fails to improve, or if in even less time he seems to be losing ground surgical treatment should be advised.

Rose investigated a series of supposed medical cures and found only one-third of them to be permanent. The trouble about medical cures is the accuracy of

diagnosis. It is only in the operative cases that the diagnosis can be positively asserted. If surgery is indicated in bad cases and accomplishes 85 per cent of cures, as it does according to Sic, why should it not be invoked in the early cases, especially now that we recognize the most frequent location and are directing our efforts to the removal of the actual focus, if not the primary seat?

As contra-indications to the operation should be mentioned advanced pulmonary, laryngeal, or pleuritic implications or implications of the intestines, kidneys, or liver. Cases presenting high temperature and generalized infection should be avoided. In children under one year of age the peritoneum is only a part of the general miliary infection and should not be molested. Persistent enteritis or mesenteric implication are contra-indications. Operation is unavailing in the dry fibrous forms, except for obstruction. Operations for acute perforation are very disastrous. The ulcerous forms with emaciation are also forlorn, and the suppurative types are particularly hopeless. Operation for fecal fistulæ are usually mortifying failures.

The technic which has been most satisfactory consists in the evacuation of the fluid and inspection of the pelvic cavity in Trendelenburg's posture. Examination of the appendix and cecum and the removal of all foci, if possible, should be the rule. The stumps and the walls of tubercular abscesses should be dried and rubbed with gauze. Drainage is unnecessary and frequently leads to secondary infection or to fistulæ. Irrigation is likewise not indicated.

The operative mortality-rate should not be over three per cent. Neff records fifty per cent of permanent cures and marked improvement in eighty per cent.

Dr. Jabez B. Jackson (Kansas City, Mo.): I want to say a few words in connection with this excellent paper of Dr. Haggard, and, first, as to the relative hopelessness of suppurative tubercular peritonitis. My experience has been quite contrary to that of the essayist in that I have had three cases of diffuse suppurative tuberculous peritonitis that have been cured. Curiously enough, one of them was cured by nature. A little child was brought to me with tuberculous peritonitis with protrusion of the umbilicus and beginning ulceration. While we were waiting to get the consent of the mother to operate, ulceration occurred, and the tubercular fluid evacuated itself. The father, a Russian, refused operation. The child made a recovery after this discharge. This case occurred over ten years ago.

The second case was that of a little child, who was operated on five years ago, with perfect restoration to health.

The third case was that of an adult woman, and it is interesting from the fact that the fluid presented itself in Douglas' cul-de-sac. Owing to the critical condition of the woman at the time we were afraid to give her an anesthetic. She had a pulse of 140 and a temperature of 103.5°. Without anesthesia we opened up the cul-de-sac and established drainage. It is now three years since the operation was done, and she has been in perfect health since then.

Speaking of cases of diffuse tuberculous infiltration of the gut wall: I recall that some years ago I operated on one of the most remarkable cases I have ever seen. The patient was a young man, in whose case I made a diagnosis of tuberculous peritonitis, with a clean-cut family history of a tuberculosis and a cousin who had been operated on for tubercular peritonitis. On opening the abdomen, while there was considerable ascitic fluid, there were no tubercles on the peritoneum, but the transverse and descending colons and upper portion of the sigmoid were converted into a solid tube. The patient subsequently died, and I have the specimen in the laboratory. The lumen of the gut was such as not to admit a pencil with pressure. The thickening of the wall between the serosa and mucous membrane was nearly an inch.

Another interesting case of tuberculous peritonitis that came under my observation was interesting from the fact

that the first manifestation was a tuberculous hydrocele. At the time of the operation on the hydrocele there was no suspicion of abdominal tuberculosis. A diagnosis was made of hydrocele, and the opening of the sac disclosed characteristic tubercles. The result was that the sac and testicle were removed completely. Shortly afterwards, within about a month, the patient returned with a recurrence of the disease in the inguinal canal. There were no abdominal symptoms at this time; however, while the patient was convalescing in the hospital he began to complain of acute pain in the epigastrium, to which for some days we gave very little attention. Finally, in making an abdominal inspection I noticed a characteristic mass on a level with the umbilicus. On abdominal section the peritoneum was found studded with miliary tubercles. That patient is likewise well. He is a young farmhand, and it is about five years since the operation was done.

My experience has taught me that we can expect more curative results from tuberculous peritonitis in the future than we have had in the past, and that in cases of the serous-effusion type results are particularly gratifying.

Dr. David P. Mayhew (Colorado Springs, Colo.): I do not believe that the presence of tuberculous infection in the pleura and lungs is in any respect a contra-indication to operation for tuberculous peritonitis. We have seen a great number of these cases at Colorado Springs, and we find that operations for tuberculous peritonitis, or other pathological conditions of the abdomen, are followed by favorable results, and that the prognosis of the pulmonary condition is much better.

I think we have been too much afraid in the past about operating on patients suffering with phthisis pulmonalis. I have operated on a considerable number of these cases during the last five years, and in by far the majority of cases the pulmonary condition has been benefited by abdominal operation. I have in mind at the present moment a case of tuberculous appendicitis and pericolitis in a young man who was suffering from fairly advanced pulmonary tuberculosis, upon whom I operated, removing the appendix and a portion of the cecum. He not only got well from the operation, but the lung condition cleared up. He afterwards studied medicine, graduated, and is now an interne in one of the Denver hospitals. I might cite case after case of that sort, but I

simply wish to bring out the point that pleural or lung involvement is no contra-indication to operation.

Dr. R. C. Coffey (Portland, Oregon): The work of Wright and his followers throws some light on this question. It seems quite probable that most of the intestinal tuberculosis, as well as of tuberculosis of the glands, is of the bovine variety.

I have had some experience in treating these cases with serum and in taking cognizance of the opsonic index. I happen to be in a hotbed of specialists in tuberculosis in Portland, although it is not a tuberculous country. There is no question but that the tuberculin treatment under the opsonic index is a remarkable aid in all these conditions. It is probably true that one of the best explanations for the cure of abdominal tuberculosis by simply opening and exposing the abdominal cavity to the sunlight, is given by the followers of Wright who believe that an autogenous vaccine is produced in some way by the irritation of the air and light. It seems to me that we should pay some attention to the opsonic index, instead of using tuberculin by our rather inexpert methods.

Dr. Joseph Rilus Eastman (Indianapolis, Ind.): I believe that the position taken by Dr. Hertzler, of Kansas City, namely, that hyperemia plays a more important rôle in the cure of tuberculous peritonitis in cases in which the tubercular focus cannot be reached and removed than does the relief of pressure or the entrance of light, has some element of justice in it, and also that the continued entrance of atmospheric air is more calculated to produce and maintain hyperemia than the entrance and presence of air for a short time incident to the opening and closure of the abdominal wound at one sitting, and that the continued presence of atmospheric air keeps up the hyperemia; and therefore I have, after opening the abdomen, introduced a boat-shaped silver device to keep the abdominal wound open. This instrument consisted of a frame, made of silver, with flanges above and below, so that the abdominal incision was kept open. I have used this in a single case, which, of course, proves nothing. It was not, however, a case of the purely ascitic type. There were many plastic adhesions. The patient recovered. The device was left in the abdominal wound for three weeks.

Dr. B. B. Davis (Omaha, Neb.): There is one point I wish to emphasize, inasmuch as it has been spoken of quite considerably, in the light of some of my own experience. I operated for tuberculous peritonitis some years ago by simply opening the abdomen, evacuating the fluid, and then closing the incision, and there was early recurrence. In that case I re-operated, searched for the focus, and found a tube which was involved. I removed this tube, and the patient made a permanent recovery. I wish to emphasize the point that we must get at the primary focus, or, at least, the focus which is liable to re-infect the peritoneum; and, it seems to me, when we fail to do this we shall fail to cure these cases. I believe a great many of them are not cured by operation, simply because we have overlooked the infecting focus, and these patients get a re-infection.

Dr. F. Gregory Connell (Oshkosh, Wis.): I wish to emphasize one point, and that is, that surgery in cases of tuberculosis is never sufficient within itself. It should be preceded, accompanied, and followed by routine hygienic treatment, which has been so satisfactory in pulmonary tuberculosis, namely, rest, fresh air, sunshine, and good food.

Dr. D. S. Fairchild (Des Moines, Iowa): In regard to the suppurative forms of tuberculosis peritonitis: We have had in our practice two cases similar to those mentioned by Dr. Jackson, It is proper to say that both of them were operated on by my son. They came under his observation and were treated by him, and I had the opportunity of seeing the results. Both of them were drained, and both recovered. They were in children of about six or eight years of age.

Dr. Haggard (closing the discussion): I am very much gratified that my paper has received so free a discussion, and in conclusion I wish to say, I heartily agree with Dr. Connell in reference to what he has said about the after-treatment. This was exemplified in one case I did not report, where the patient received the continuous administration of bacillary emulsion, which was prepared for us by Dr. Litterer, and a very satisfactory result was obtained. We use the *x*-ray also in these cases, with the hope that we may help nature and in that way bring about a spontaneous cure.

ACCIDENTS AND COMPLICATIONS IN GOITER OPERATIONS

C. H. Mayo, M. D.

ROCHESTER, MINNESOTA

The technic in the surgical treatment of simple goiter has now so nearly reached a stage of perfection that the operation is a comparatively safe one, barring accidents and complications. In the early days of abdominal surgery we not infrequently heard of a death from the slipping of a ligature, and there followed many long discussions upon the best method and the best material for ligating. So in surgery of the thyroid gland is hemorrhage, either primary or delayed, a matter of serious consideration because of the number of deaths which occur from this cause in proportion to the number occurring from other complications, such as sepsis, shock, or tracheal collapse.

We have had a ligature slip several times while the patient was on the operating-table, and three times this accident has been the occasion of delayed hemorrhage. The slipping ligature has always been the one ligating the superior thyroid artery, and it has seemed as though some of the muscle fibers of the omohyoid were included in the ligation, and that the movement of the neck displaced the ligature.

A large amount of blood may be lost in operating upon colloid goiter, and there will be but little delay in the recovery of the patient, but in hyperthyroidism

the loss of blood is a more serious matter on account of the general physical condition of the patient. In order to cleanse the wound from blood and make it possible to secure the artery it may be necessary to compress the common carotid between the fingers, one within and the other without the wound.

Hemorrhage from veins is a great annoyance in operating on large goiters, as the trachea is often softened and distorted, rendering manipulation a serious interference to respiration, which greatly increases venous pressure. In large goiters it may be advisable to divide the gland at the isthmus, free the trachea and turn the thyroid lobe out from, instead of toward, the center. In benign goiter the tracheal rings are softened laterally. Intrathoracic goiters are usually encapsulated, which fact permits their enucleation. Only once have we had serious hemorrhage from this type, and in that case it was controlled by four large abdominal pads packed into the cavity. They were removed on the fifth day. The enormous cavity was apparently closing normally when on the fifteenth day there was an almost fatal hemorrhage, and again on the 22d and 27th days. The cavity was then filled with Beck's paste of paraffin, bismuth, and vaseline, and it healed at once. We have not seen a serious case of air-embolism.

There have been several cases of tracheal pressure from the tumor, causing difficulty in respiration. The goiters were usually encapsulated adenoma close to the trachea and next to the sternum, or in the form of an intrathoracic tumor.

Occasionally a dense colloid or exophthalmic goiter will greatly compress the trachea, which has become softened. In one case a colloid growth was removed, and death occurred on the third day from tracheal collapse. This condition required a tracheotomy on the table during operation in three different cases: once

in cancer (of which there were 16 cases), once in a colloid of great size, and once in exophthalmic goiter. Complete relief and recovery followed except in the case where carcinoma had penetrated the rings developing within the trachea. This patient lived for a number of months wearing a long, flexible trachea-tube.

Hoarseness or a complete loss of voice may occur from the pressure of a hard goiter compressing the recurrent laryngeal nerve. We have observed this condition in colloid goiter, exophthalmic goiter, and in malignancy. All cases of goiter should be examined with regard to the condition of the vocal cords before operation, as a cord in slight paresis before operation may become completely paralyzed within a few days afterward, from the slight traumatism of the recurrent laryngeal nerve. These cases should recover eventually, although weeks may pass before function is complete.

If the operation is one of enucleation the recurrent laryngeal nerve is rarely injured. In extirpation the posterior capsule of the gland should be preserved. As an additional precaution individual vessels must be caught and ligated, especially those of the inferior thyroid artery. The forceps is applied so as to close in the vertical line of the neck, and not across it. This application is less likely to include the nerve in the grasp of the forceps in the blood-discolored tissue. In from five to seven per cent of thyroidectomies some slight injury occurs, but it is rarely permanent.

Deep suturing with catgut may occasionally include the nerve, but, as such sutures are seldom of great tension, recovery follows a limited period of hoarseness. In cases of paresis on one side the compensation of a sound vocal cord is remarkable, some help being derived from the superior laryngeal nerves.

In ligating the superior thyroid arteries and veins a

point is selected for the ligature opposite the thyroid cartilage between the two laryngeals, superior and inferior or recurrent, at the upper pole of the gland.

In operating upon cases of hyperthyroidism the general physical condition of the patient is apt to be the serious complication. Has the operation been delayed until heart-muscle degeneration, fatty liver, gastric crises, and intestinal complications render the condition serious? In that case we must consider the loss of blood, the possible shock of the anesthetic, and the excitement as factors that may possibly cause death. Prolonged preliminary treatment may be necessary, or double ligation of the superior thyroid vessels, under cocaine, may be the only safe procedure preliminary to the operation for thyroidectomy.

In 575 cases of colloid, diffuse or encapsulated adenomata, there were four deaths, two of which would come in the above classification, as one was from tracheal collapse and one from secondary hemorrhage. The third death occurred from lobar pneumonia, and the fourth from septic pneumonia.

In 410 cases of hyperthyroidism there were nineteen deaths, but with changes in technic and the correction of faults in judgment as to the proper periods for operating, this mortality has been reduced from twenty-five per cent in the first sixteen cases to four and five per cent.

In operating for colloid goiter a portion of the best appearing part of the thyroid should be left, while in operating for hyperthyroidism a smaller portion of the gland substance seems to be sufficient. Should a patient develop an excessive amount of fat or a general obese condition after operation, it is probable that too little gland has been left. Thyroid feeding will give relief in this as well as other conditions associated with the hypothyroidism. The feeding of thyroid

can be continued at intervals, or the transplanting of thyroid gland tissue can be made.

The parathyroid bodies are seldom seriously diseased, and when removed it is an accidental complication which may not cause trouble if but one or possibly two are injured or taken. While we have had no experience with tetany in our cases, we are nevertheless careful to replace beneath the capsule of the gland any small detached gland-like body resembling them removed during thyroidectomy.

DISCUSSION

Dr. Emil G. Beck (Chicago): Since the Association has extended to me an invitation to participate in your discussions, I want to say a word or two in regard to the hemostatic action of bismuth paste, which was used in these cases. I have not had any experience in using it for hemostatic purposes; however, I know it has been used in nose and throat work by my brother. There is an element of danger in using it for fresh hemorrhage, for the reason that it may be sucked up, when in a liquid state, into the open vein, and carried to the inferior vena cava or by some vein into the pulmonary artery and cause immediate death. One case of this kind is on record.

I have made some experiments in regard to injecting the paste into the veins of animals, and death was immediate. Sections of the lung from the patient who died showed that the small arteries were blocked with the paste. For two weeks after this bleeding cavity had been packed with gauze there evidently must have been sufficient granulation present to prevent any entrance of the paste into the circulation. I do not suppose the paste has remained in the cavity, but it has been gradually extruded by closure from below.

Dr. John P. Lord (Omaha, Neb.): In connection with this paper I wish to speak of a case I had about three months ago when I was called upon to operate on an Indian woman, thirty-six years of age, who had had a goiter since puberty. The goiter was enormous, measuring twenty-eight inches from the lobe of one ear to the lobe of the other, twenty-two inches from the chin to the episternal notch. It proved to be colloid. The case was altogether too much for my skill, and I failed to operate

upon it successfully. The hemorrhage was quite beyond my control because I was unable to command the situation on account of the enormous size of the goiter. I finally found it necessary, in order to get rid of the tumor, to place clamps upon it, more particularly upon the isthmus, in order to get it away, and the patient died within five or six hours after the operation. A post-mortem examination was not allowed. It seems to me, if I had to deal with such a case again, I would undertake to remove but one lobe at a time. This tumor weighed nearly eight pounds after removal, and it showed these sections so very distinctly that in examining the specimen I felt I could have removed one of the lobes, and by so doing would have had a much less complicated procedure, and I could have perhaps been able to control the hemorrhage with only one-third of the amount of base to deal with. It left me feeling that I was very helpless in the presence of such an emergency, and I shall be glad to have Dr. Mayo, in his closing remarks, suggest a line of procedure in a similar case.

DR. MAYO (closing the discussion): The point brought out by Dr. Beck, that bismuth may get into the vessels and produce pulmonary embolism of the finer capillaries, is something none of us knew of at the time I did this operation, which was filling a large cavity in the chest. This was done last spring, and it has been only in the last few months that we have heard of any deleterious effects from the use of bismuth by getting into the veins and causing sudden death. The wound did not extrude fluid. The paraffine is in there yet, and healing occurred five days after it was put in.

As to serious hemorhage from goiter: I have had no goiters in which we were unable to check hemorrhage at the operation, and some of them have been enormous. The hemorrhage from one of the cases I have reported was the most profuse I have ever seen, and have the patient live. Blood literally boiled out of the neck, and the only thing to do under the circumstances was to pack in big sponges in order to control it. There is nothing in the front of the neck we need to preserve except the common carotid artery, one pneumogastric, and one phrenic, and the troubles we have from surgery of the neck are from inefficient exposure. I have operated on several goiters that measured over twenty inches across the front of the tumor, and resting down to the middle of the sternum.

In one case the goiter measured thirty-one inches around, and when we think of an ordinary girl's waist being only about twenty-two to twenty-four inches, we have an idea of the size of this goiter. This measurement included only four inches back of her neck not covered by tumor. The veins were as large as a hose-pipe.

We should not deal with these cases blindly. It is necessary to have abundant room and to take considerable time to do the work. More time is required than is usually given to these cases for a free exposure of the tumor,

THE INDICATIONS FOR OBLITERATIVE IN CONTRADISTINCTION TO RECONSTRUCTIVE ENDO-ANEURISMORRHAPHY

WILLIAM J. FRICK, M. D.

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A consideration of the surgery of aneurism, and especially of the various procedures of Matas who has done so much to stimulate interest and activity in this particular field, early leads to a discussion of the advantages or merits which one method enjoys above another, and as deductions certain well-marked contra-indications which a further report of cases and our own experience seems to corroborate. It is quite certain that those would be operations of choice which in a plastic manner restored the blood-stream, practically, to its former course, and thus re-established a normal peripheral blood-supply without endangering either nourishment or function of distal parts.

Matas' procedure, which in theory and frequently in practice accomplishes this end, is his operation of restorative or reconstructive endo-aneurismorrhaphy. It goes without saying that the more important the artery, or the more central the situation of the aneurism the greater is the desirability and necessity of a method to restore the blood-stream to its integrity, as is attempted by the restorative or reconstructive operation. However, in the face of this ideal procedure and of a number of brilliant accomplishments

in this line, further clinical experimentation shows that there are often grave obstacles to its success. We find that the vast majority of contra-indications to the ideal procedure reside in the morphology of the sac itself, and are not revealed until the operator is face to face with the interior of the sac, stripped of clots and fibrinous deposits.

From a surgical view-point the simplest form of aneurism is one of the saccular type, occupying a position, as it were, of a lateral outgrowth from the main arterial trunk, and within which sac the orifice of communication with the artery is small, and which, from its nature, does not, except from pressure or inflammatory deposits, encroach upon the blood-stream. Here a simple plastic suture of the orifice plus the closure, if any, of minor arterial openings within the sac and the obliteration of the aneurismal cavity by buried sutures or perhaps the infolding of skin flaps, or the use of gauze packs, etc., according to the methods of Matas, appeal to one most strongly in ease, simplicity, and rationality.

The following case illustrates the type of aneurism just described, but the method of operating differs somewhat from the Matas restorative operation.

CASE 1.—This was a ruptured sacciform aneurism of the femoral artery situated at about the junction of the upper and middle third of the vessel. A localized area over the surface of the tumor mass was ulcerated and bleeding. When this patient entered the hospital there were several hemostats attached to the substance of the mass, to arrest hemorrhage.

Operation, October 11, 1905. Blunt dissection into the tumor showed it to be a sacciform aneurism with a very small opening into the main vessel. The sac though slightly adherent to the surrounding tissues, was freed and ligated flush with the main artery. This approximated the coats of the aneurism at its

neck and obliterated the opening. The sac was snipped by scissors and the wound dressed. The post-operative history was uneventful, the patient leaving the hospital on the eleventh day with no symptoms of his trouble.

Leaving, now, this simplest category of cases, which may unfortunately be but a small proportion of the whole number, our next phase in simplicity of intra-saccular conditions is one where the main orifices of inlet and outlet are separated by a variable interval with perhaps the old stream-bed still traceable connecting them. Here with a smooth, healthy serosa in this inter-orificial area, with pliable, comparatively healthy walls to enter into the formation of our new artery, with no collateral orifices requiring sutures to complicate the field—with all these conditions most favorable, reconstructive suture over a rubber tube or guide has, in a fair number of cases, shown itself quite feasible. Unfortunately, all these desirable factors may not be present. Conformation may favor, but the wall may be stiff, brittle, and not available for plastic work, or the serosa may be so defective that with the further insult of sutures and manipulations the operation would fail in its immediate designs, and become, in fact, an obliterative procedure by the formation of a thrombus at the operative site.

Not to discuss the various shapes and conditions within the sac which oppose the ideal procedure, further than these few suggestions indicate, we believe that in the vast majority of cases the radical obliterative endo-aneurismorrhaphy is the operation to be preferred for the following reasons:

1. The procedure is definite, thorough, and radical.

2. No plastic work in diseased tissue is required, such work being notoriously uncertain.

3. In a majority of cases the sac configuration

and intrasaccular conditions will preclude plastic work.

4. In reported cases where apparently either method might have been employed equally well, the obliterative method has been more satisfactory and shown greater freedom from untoward sequelæ, such as recurrence, hemorrhage, thrombosis, grangrene, etc.

5. An aneurism (pathologic) is a malignant degeneration in a vital structure. The diseased vessel can no longer be depended upon and deserves obliteration.

CASE 2.—Our second case was that of a large popliteal aneurism of nine months' duration. Operation November 20, 1906. The operative field was made bloodless by an Esmarch bandage. A longitudinal incision extending beyond the tumor above and below the aneurism gave free access to the sac. Without further destroying the external relationship of the sac the tumor was incised throughout its full length, the blood clots and fibrin removed, and the interior cleansed and dried. The proximal and distal openings of the artery were found at the bottom of the sac about two inches apart.

After a careful study of available tissue a reconstruction of the artery was attempted, suturing with No. O iodized catgut over a No. 14 F catheter as a guide, the cavity being obliterated by buried sutures. Upon removing the tourniquet the vessel below the tumor could be distinctly felt and seen pulsating, showing that the artery was in fact reconstructed.

The subsequent history of this case was almost uneventful. The limb was restored in function. The man is entirely well and has resumed his work as a drayman. There is no proof that the patency of the artery was permanent. We have never been able to detect a tibial pulse.

CASE 3.—Our third case was also a popliteal aneur-

ism. The patient was able to get about only with the help of a crutch and cane. A large pulsating tumor occupied the right popliteal space. The leg was swollen, and no pulse could be felt. In this case, as in the one just reported, the field of operation was made bloodless by the use of an Esmarch bandage at the upper part of the thigh. A skin-incision of sufficient length exposed both the upper and the lower part of the aneurism. The sac was emptied of clots and fibrin. The interior of the sac was rough and corrugated and showed two arterial openings besides those of the parent artery. The walls were so friable and the endothelium between the openings of the parent artery so uninviting, that an attempt to reconstruct the artery was abandoned. All arterial orifices were closed by intra-saccular sutures, and the sac obliterated by tiers of buried catgut sutures according to the Matas method. The wound was closed with drainage, the drain being removed on the second day.

This patient left the hospital on the tenth day and was soon at work as a Pullman porter.

The technic of intra-aneurismal surgery resolves itself into several distinct essential steps:

1. Preliminary hemostasis. To accomplish this is more or less difficult, according to the situation of the aneurism. Esmarch compression of the main artery above, and temporary, direct compression above and below are variously used. A bloodless field is almost a *sine qua non*.

2. Free opening of the aneurismal cavity, to permit a careful survey of the interior of the sac, before deciding the plan of procedure.

3. Intra-saccular suture of orifices.

4. Obliteration of the cavity by sutures.

5. Closure and drainage.

The after-treatment of these cases is usually simple, only one or two points being worthy of comment.

The member or part operated upon is best immobilized by some suitable fixed dressing in a position of relaxation. This prevents tension on the vessel-wall longitudinally, and also allows free play for the establishment of a collateral circulation.

Drainage should be removed early—as soon as its purpose is served.

DISCUSSION

Dr. John P. Lord (Omaha, Neb.): I have been greatly interested in this subject from the first, and more particularly in the work of Matas and others, and I have been looking for cases that were suitable for this procedure. I have had a couple of popliteal aneurysms recently, and when I came to consider the feasibility of this method, and began to look my subjects over, I found, in both of these cases, that they were poor subjects for surgical exploitation. The arteries were generally sclerosed; their arterial tension was high; and while the kidneys were in fairly good condition, they were not so good but what a person would consider all the damage which might result from the anesthetic. One of the patients was a man, 60 years of age.

When one looks over the literature thoroughly, he becomes impressed with the wisdom of John Hunter and with the value of his procedure of ligation of the femoral artery, and he is particularly impressed with the simplicity of this operation. It is easily borne by the patient, the likelihood of return is small, you can cure the patient for a year or two, and if the condition does return after that, the trouble is farther removed.

I ligated my cases. They did well, made good recoveries. and are still living, and under judicious medical guidance they are enjoying better health today than they did formerly.

The advice of my medical brethren in consultation in these cases was that the least surgery we did on these cases the better, and I quite agreed with them and fell in with that idea. I am not fully convinced of the advantage of doing aneurysmorrhaphy on cases of popliteal aneurysm. It does not appeal to me, and I am still to

be convinced of its desirability. I hope I am not too pessimistic in regad to this. I want to move along with the profession and be in harmony with the spirit of the younger and more enthusiastic men in regard to new surgical procedures, but this operation for popliteal aneurysm does not appeal to me, and I think the case would have to be a very favorable one for me to undertake this procedure in this location, because I believe it to be unnecessary and more hazardous than other procedures. We do know that there have been failures, and there have been very anxious periods during the after-treatment.

RENAL CALCULI

DANIEL N. EISENDRATH, A. B., M. D.

CHICAGO

1. *Historical.*—Although the presence of stones in the kidney has been known for centuries, and various operations have been performed for the drainage of abscesses caused by the presence of such calculi, the modern history of the subject dates from the time when Simon, in 1871, removed a kidney for calculi because he feared the hemorrhage incident to a nephrotomy. Henry Morris, of London, was the first surgeon to perform a nephrotomy for calculi, and Czerny the first to make an incision into the pelvis (pyelotomy) for the same purpose. With the perfection of our methods of diagnosis of the surgical diseases of the kidney, especially the use of the *x*-ray and ureteral catheterization, the number of cases which have been successfully operated upon for renal and ureteral calculi is rapidly increasing.

2. *Etiology.*—Although by analogy with gall-stones, one would expect to find a nucleus in the majority of renal calculi, yet, as a matter of fact, this is seldom the case. A blood-clot, particles of inspissated pus or mucous mass of epithelium and parasites, such as the bilharzia and distoma hematobium, are only rarely found as the nucleus. That the disease is more prevalent in tropical countries, and that those persons whose nitrogenous metabolism is disturbed are predisposed to the formation of calculi in the kidney, are well

recognized facts. Calculi are most often present in but one kidney, but there can be no question that, if one is content in a case of suspected renal calculus with simply taking a skiagraph on one side, many bilateral stones will be overlooked. I will refer again to the necessity of taking compression-pictures of both kidneys, since the presence of bilateral calculi is not nearly as infrequent as has been generally believed. In a recent case of the writer's, the skiagraph showed the presence of calculi upon both sides, although all of the symptoms were referred to the left kidney. Kummell, in a recent article (*Zeitschrift für Urologie*, Nos. 3 and 4, 1908), found bilateral calculi in sixteen out of 101 cases, *i. e.*, nearly 16 per cent. Israel, in his book on "Surgery of the Kidney," published in 1901, estimates that the calculi were present on both sides in 27 per cent of his cases.

3. *Frequency and Position.*—As to the relative frequency of the various forms of calculi it is a generally accepted fact that the pure uric acid or urate calculi occur most frequently; next the oxalates and phosphates. Other forms, such as the cystin and xanthin, occur quite rarely. The uric acid and oxalate stones are usually found in acid urine, but when the latter becomes alkaline, the deposition of ammonium and magnesium phosphates takes place and the calculi grow quite rapidly in size.

Renal calculi vary greatly in their shape and size. Those found in the parenchyma are usually quite small and are oval or round. In the calyces they become larger and often have the shape of a calyx. Those which are found close to the orifice of the ureter are longer, and are more often hammer-shaped, having a broader upper and a narrower distal portion. Reference will be made in the description of the *x*-ray diagnosis of the fact that one can often recognize the position of the calculus, if a single one be present, as

being close to the outlet of the renal pelvis by this peculiar prolongation toward the ureter. The number varies from one to a thousand, and their size varies in accordance. In advanced cases they may be so large as to occupy the entire dilated pelvis, giving rise to a peculiar form, which has been spoken of as coral-like, having a number of projections from a central broader portion.

4. *Pathology.*—Every calculus causes more or less damage, both to the kidney in which it is located and to the opopsite one. One of the most important factors in the development of the surgery of the kidney during the past ten years has been the information which the methods of determining the functional capacity of each kidney have given us as to the extent of such damage to the parenchyma. The renal changes due to the presence of calculi, vary greatly, according to whether the urine has remained aseptic or whether it has become infected. Calculi may be present in a kidney for many years without giving rise to symptoms or causing any changes either in the kidney in which it is located or in the opposite one. In other words, as long as the urine remains aseptic and the calculus is in such a position as not to obstruct the outlet of the pelvis and cause back pressure upon the parenchyma, but little damage is done.

In the aseptic calculous kidney the possible pathological changes are (a) a contracted kidney, due to the production of connective tissue between the tubules; (b) a variable degree of hydronephrosis, or, more properly speaking, uronephrosis. As a rule, this second sequel is of minor degree unless the ureteral orifice is almost completely blocked.

In the infected calculous kidney the possible sequelæ of such an infection are—

(a). A pyelitis, which is in reality seldom confined to the pelvis alone, but extends upward along the tubules and involves the parenchyma.

(b). A pyelonephritis, in which the parenchyma may be simply the seat of an extensive leucocytic infiltration, or the infection is more active and causes the formation of multiple miliary and larger abscesses scattered through the medulla and cortex. The macroscopic appearance of such kidneys, with their groups of little abscesses scattered over the cortex, is quite typical.

(c). A pyonephrosis. This is an advanced stage of the condition described as pyelonephritis, and is the result of the disintegration of the parenchyma, with the formation either of large cavities separated by septa and containing pus and calculi. If the ureter is blocked the entire kidney is converted into a sac containing pus and calculi.

(d). An infected hydronephrosis. In this an aseptic hydronephrotic or uronephrotic calculous kidney becomes infected, and the dilated pelvis or calyces, instead of containing urine alone, contain both urine and pus, there being sufficient parenchyma left to continue the excretion of a fair amount of urine.

(e). The various forms of paranephritic complications of an infected calculous kidney. Here we may have either a paranephritic abscess or the production of granulation and, later, of scar-tissue around the kidney.

(f). Finally, we may have a part or the entire kidney parenchyma replaced by fat, whose origin is probably in the capsular fat. An instance of such a sequel of infected stone kidneys has been recently reported (Annals of Surgery, November, 1908) by the writer.

The effect of calculi in one kidney is to cause hypertrophy of the opposite one. In some cases the other kidney is either absent or has remained in its state of embryonal development called hypoplasia. If infection is present in one kidney, the opposite is often secondarily infected through the bladder and along its own ureter, termed "ascending infection."

If calculi are present in both kidneys the changes in each one go on independently of the other, depending upon whether one or both are infected. We thus see that many pathological changes take place in a kidney which is the seat of calculi. The extent of destruction of renal parenchyma can be fairly accurately measured by our modern means of determining the functional capacity of each kidney, described more fully under treatment.

5. *Symptoms.*—There are no symptoms which can be said to be pathognomonic for renal calculi. In the absence of positive proof in the *x*-ray plate, the diagnosis must always remain one of exclusion. Pain, hematuria, and the passage of calculi in the urine would be positive signs, but they are rarely found together.

To take these symptoms up separately, we must first consider—

(a). Pain as a symptom. In many patients the only sensation is a dull aching, seldom a distinct pain, over the affected kidney. This is increased by running, jumping, or any form of violent exercise or work.

In some cases there is a distinct pain felt over the kidney and radiating down along the ureter. The larger calculi, which remain stationary, are less apt to cause pain than the smaller ones, which are apt to become lodged in the ureter or to migrate along it toward the bladder. During the passage of such a small calculus along the ureter, the peristaltic action of the ureteral musculature is so violent as to give rise to the clinical picture of renal colic.

At this point I wish to call attention to a curious similiarity between the history of the subject of gall-stones and that of kidney calculi. For many years the general impression existed that one of the necessary factors in making a diagnosis of gall-stones was to obtain a history of colicky attacks. The profession is just beginning to become aware of the fact that al-

though renal colic is present in a fair proportion of cases of renal calculi, a history of renal colics is not by any means essential in making a diagnosis of nephrolithiasis, and, furthermore, that a number of other renal and ureteral conditions can produce such a colic. The symptom-complex known commonly as renal colic is characterized clinically by the more or less sudden onset of severe pain, either first felt over the lumbar region or radiating along the ureter toward the bladder, testis, penis, inner side of the thigh, stomach, or abdominal wall. At times the pain is referred to the opposite side, but, fortunately for the diagnostician, such reflex reference of pain is not frequent, but must, nevertheless, be constantly borne in mind. The pain just described is accompanied by evidences of shock or collapse, such as a rapid pulse, cold, clammy sweat, restlessness, expression of anxiety, and pallor. There is usually also some nausea and vomiting present. The pain may be quite localized in the ureter and not radiate. When such a condition is present upon the right side, the simulation of appendicitis is very puzzling to the less experienced observer.

The other conditions which can cause renal colic are acute congestion of one kidney, obstruction of the ureter by a valve, stricture, blood-clots, inspissated pus and mucus, and, finally, kinking of the ureter in floating kidney (Dietl's crises).

(b). Hematuria: Blood in the urine is a most important symptom. The blood may only be found during the attack of renal colic or it may be present in small quantity constantly. In this connection it must not be forgotten that blood corpuscles may be found in the urine during an attack of appendicitis. The mere presence of blood in the urine does not signify renal or ureteral calculi, since it may occur in tumors, in tuberculosis of the kidney or bladder, and in the so-called essential hematuria of the kidney, as

Fig. 1. Specimen from a case of calculous anuria.
R, Right kidney showing abscesses of pyleonephritis. L, Left undeveloped kidney. B, Bladder. CA, Ureter above occluding calculus. UC, Distended with urine. URE, Calculus at vesical end of the ureter.
Fig. 5 (to the right). Cumston's nephrotomy clamp.

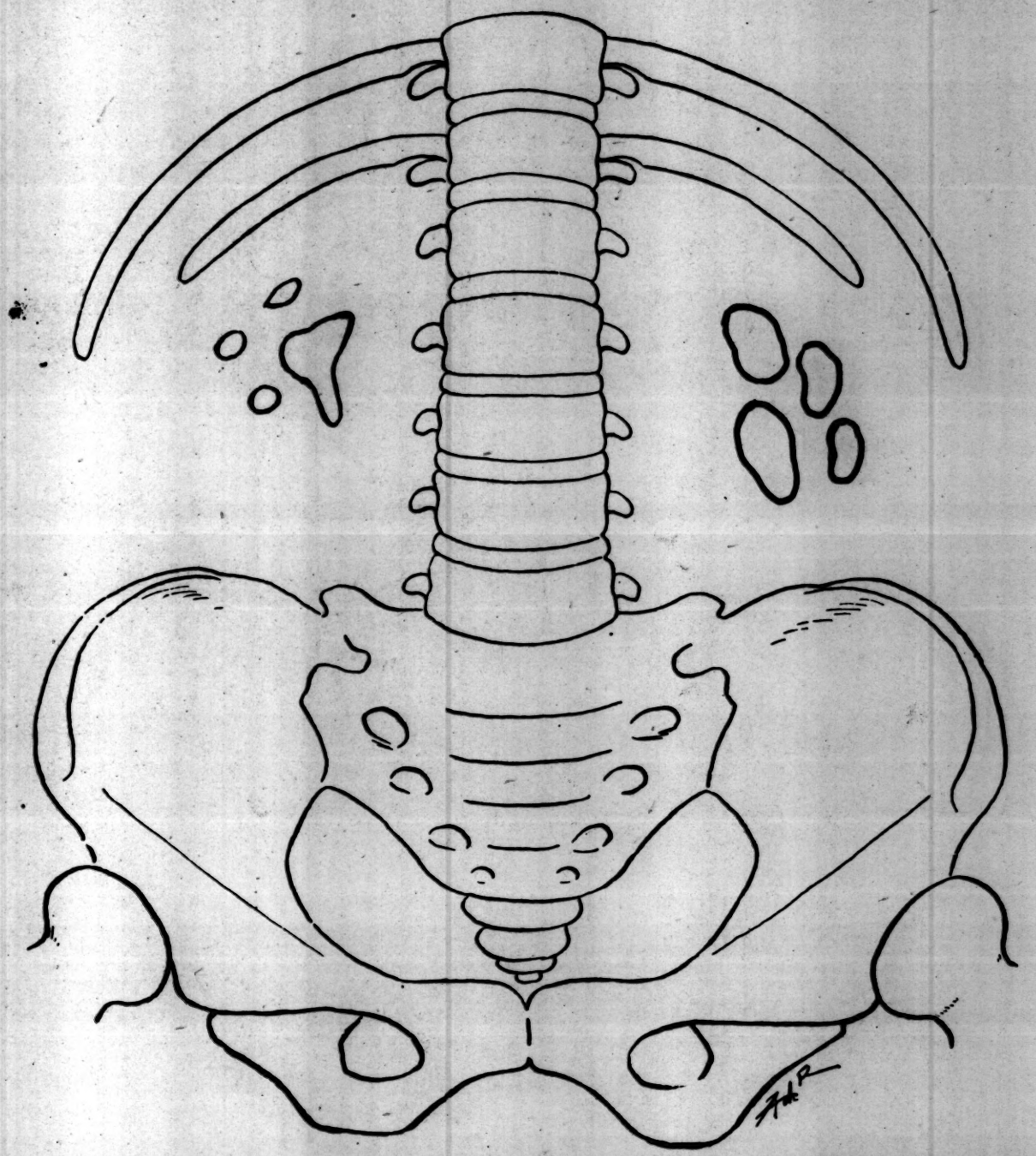

Fig. 2. Tracings of skiagraph of a case with bilateral renal calculi.

Fig. 3. Pyelotomy for removal of calculi, close to outlet cf pelvis.

well as in certain forms of nephritis, especially those of an interstitial type. The older tests which attempted to differentiate between vesical and renal sources of the blood by the condition of the red corpuscles and by the fact that the blood appeared at a certain period of the act of urination, can no longer be relied on.

The use of the cystoscope is the most reliable mode of diagnosis and will soon tell us, in the majority of cases, whether the blood is of vesical or renal origin.

The presence of blood in the urine, combined with the history of renal colics, or of long-continued pain in the lumbar region, will, in the absence of a positive *x*-ray picture, only be suggestive of renal calculus, if other renal lesions, such as tuberculosis, tumors, pyonephrosis and hydronephrosis, be excluded.

(c). *X*-Ray: The use of the *x*-ray has been of the greatest aid in the diagnosis of renal and ureteral calculi. The majority of surgeons who have systematically employed it in their cases of suspected renal calculi are agreed that, with the proper technic, shadows of calculi can be secured in nearly every case in which the symptoms point to their presence. Such an able and reliable surgeon as Kummell of Hamburg believes that if calculi are present the diagnosis can invariably be made from the *x*-ray.

Just a few words in regard to the proper method of taking *x*-ray pictures of renal calculi: In the first place, proper preparation is absolutely essential, especially in stout individuals. A brisk catharsis, followed by liquid diet during the twenty-four hours preceding the exposure, will clear the bowels of any substances which are apt to give shadows. Secondly, the lumbar region should be brought as close to the plate as possible by raising the shoulders and thighs so as to overcome the normal lordosis of the spine as much as possible. Third, a soft tube is a requisite aid. Fourth, if one wishes to be exact, a first diffuse exposure of

both kidneys and ureters should be made without the use of any special apparatus.

The recent rapid progress in the skiagraphy of renal and ureteral calculi has been due to the use of the Albers-Shoenberg compression apparatus, which cuts off all Roentgen rays except over a small area, and makes a much sharper picture. One should never omit taking such a compression *x*-ray of each kidney separately and, if possible, of each ureter. The number of cases to the present date of bilateral calculi is sufficiently numerous to require *x*-rays of both kidneys in every case. In order to consider a renal skiagraph of value the last two ribs, the transverse processes of the last dorsal and lumbar vertebræ, and the psoas muscle must be quite sharply outlined.

In the case of renal calculi one must exclude shadows due to the following conditions: (a) Tumors or dilated calyces. These show as poorly demarcated shadows. (b) Scybala. These are round, delicate, poorly outlined and darker in the center. If there is any doubt it is best to give a purgative and take another picture. (c) Foreign bodies in the intestine. (d) Calcified retroperitoneal lymph-nodes. (e) Centers of ossification in the lower costal cartilages. (See article of Holzknecht and Kienbock. Zeitschrift fur Urologie. No. 5, Volume II.)

Pure uric acid calculi cast the faintest and oxalates and phosphatic stones the most marked shadows. One can tell fairly accurately from the position and size of the shadow whether the calculus is large or small, whether it is in the pelvis or in a dilated calyx, and at times one can tell whether the calculus lies free in a large cavity by the change in its position during different exposures. As the present paper does not include ureteral calculi I will omit any reference to their diagnosis and recognition in *x*-ray pictures.

6. *The Differential Diagnosis of Renal Calculi.*—This must include such conditions as appendicitis, kink-

ing of the ureter, with or without intermittent hydronephrosis, non-calculous pyelitis and pyelonephritis, and tuberculosis and tumors of the kidney.

7. *Calculous Anuria.*—One cannot leave the subject of the diagnosis of nephrolithiasis without referring to this most important complication. True anuria arises when the arterial blood no longer reaches the kidney, or when the escape of the urine secreted is prevented by some obstacle in the ureter. The most frequent cause of anuria is the occlusion of one or both ureters by calculi. It can be easily understood how such an anuria may occur if the ureters of both perfectly functionating kidneys are occluded or if the ureter of the only functionating kidney is occluded. It may also occur where only one kidney is left after a nephrectomy has been performed, or where it is congenitally absent, or where the opposite kidney has remained in its state of embryonic development (hypoplasia.) The anuria may last from a few hours to eighteen days. One can usually make a diagnosis from the history, aided by an *x*-ray examination of both kidneys.

The treatment of these cases of calculous anuria will be referred to later.

8. *Value of the Determination of Functional Capacity of Each Kidney, and Ureteral Catheterization.*—Before any operative treatment of nephrolithiasis is considered, it is the duty of every surgeon, at the present time, to ascertain, if possible, (a) the existence of two kidneys; and (b), if the presence of the opposite kidney is positive, then to ascertain the functional capacity of this kidney.

This knowledge is acquired by catheterizing the ureters and then employing the various functional tests. In the majority of cases it is possible to insert special catheters into each ureter and obtain the urine from each kidney separately. The use of segregators

for this purpose is unreliable since it is impossible to be certain that one is not obtaining a mixed urine, *i. e.*, from both kidneys. The danger of infecting a healthy kidney through catheterization of its ureter has been greatly exaggerated, and is in reality so remote a possibility that it should no longer be considered a contra-indication to the use of the ureteral catheter.

It will be impossible to dwell at length upon the value of the various methods of estimating the functionating power, but I shall simply mention my own method of procedure. Before performing an operation upon the kidney the patient's urine is collected for twenty-four hours and examined in the usual manner. Then under local (cocain) anesthesia about one ounce of urine is collected from each kidney through the ureteral catheters (per Brenner cystoscope). This urine is carefully examined for its percentage of urea, casts, albumin, etc. Then some phloridzin is injected, and the time noted when the urine first begins to contain sugar. In a normally functionating kidney this occurs from fifteen to twenty minutes after the phloridzin injection, and from the delay in the appearance of the sugar reaction one can draw quite reliable conclusions as to the power of excretion of each kidney. The color-test, made by the injection of indigo-carmin, as first suggested by Voelcker and Joseph, is also quite reliable, and can be employed at the same examination in which the phloridzin test is being used. the blood freezes at a point below 0.58° centigrade it shows that the kidneys do not functionate perfectly The final test is to determine the freezing-point of the blood (cryoscopy) by the Boeckmann apparatus. If and many metabolic products are not being excreted.

All of these tests are of great value, but they are not infallible. However, they have been found to be quite reliable in a sufficiently large number of cases to warrant their use as our routine method of examina-

tion. It must be said at this point that ureteral catheterization is not possible in some cases, and if there is any doubt in these, before removing a kidney, the presence of the opposite one must be determined by exposing it through a lumbar incision.

9. *Medical Treatment.*—That certain cases of nephrolithiasis will be greatly improved by internal medication cannot be denied. When a diagnosis of the presence of a calculus or of calculi in the kidney has been made, it does not follow that an operation is necessarily indicated. As in the case of gall-stones, smaller calculi will often be passed spontaneously, and the subsidence of active symptoms, such as pain, renal colic, etc., will lead one to believe that the case is cured. But this sense of security is only too often disturbed when the patient is seen again suffering from a calculous anuria or from one of the sequelæ, (mentioned under pathology) of an infected stone kidney. In other words, unless we have an absence of the *x*-ray shadow and an aseptic, clear urine after the history of one or more attacks of renal colic, etc., it is illogical to conclude that the case is cured. That a stone of any size can be dissolved by any so-called solvents given internally is an utter impossibility. In the cases with pure uric acid or urate calculi the administrations of large doses of alkaline diuretics, combined with the regular drinking of large quantities of such mild alkaline waters as Celestin, Vichy, Wildunger, or one of our American lithia waters, and a non-nitrogenous diet will unquestionably cause many of the smaller calculi or the so-called uric acid gravel or sand to be dissolved or expelled. In other words, as long as the urine remains aseptic and there are no evidences of any deleterious influence of the presence of the calculi upon the kidney or kidneys involved, there is no indication for operative interference. If, however, the *x*-ray shows the presence of calculi, which we know from the size of the shadow cannot be passed

spontaneously, and especially if the urine shows the presence of pus, that patient's life is menaced by those stones, and if the tests of functional capacity show that an operation is permissible, it should be performed before serious pathological renal changes occur. We owe it to such patients to explain the dangers of the calculi and place the responsibility of delay upon their own shoulders in case of refusal to permit an operation.

Operative Treatment.—There are two principal methods of removal of renal calculi. In one (pyelotomy), an incision is made into the renal pelvis (Fig. 4) and the calculus removed and the wound sutured without drainage, unless there is an accompanying infection. In the second operative method an incision about two inches long is made a little back of the convexity (Fig. 5) of the kidney through the parenchyma into the pelvis and the calculus or calculi removed in this manner. This second method, called nephrotomy, has the advantage over pyelotomy, that it permits of more thorough and direct palpation with the finger (introduced through the kidney wound) of the entire pelvis and all pockets in the parenchyma. It has, however, the great drawback of being accompanied by hemorrhage, which at times is so severe as to almost exsanguinate the patient. This bleeding can, however, be overcome by compressing the vessels temporarily after the kidney has been brought out upon the back, with the fingers, or with a rubber ligature, or, better still, with some form of clamp, such as that shown in Fig. 6. As soon as the calculi have been removed the kidney wound is quickly closed with sutures of heavy catgut, and a rubber drainage tube, carried into the pelvis, is inserted. The clamp is then removed, and very little bleeding has occurred. The dangers of post-operative hemorrhage are, however,

not to be overlooked, and they may be so severe as to require secondary nephrectomy.

If the *x*-ray shows only one calculus and that is located at the outlet of the pelvis or close to it in a non-dilated pelvis, pyelotomy is the operation of choice. The danger of fistulæ following it can be excluded by accurate suturing. There are surgeons of great experience in renal surgery, like Kummell, who advocate nephrotomy as a routine procedure, while others, like Zuckerkandl, believe that the majority of calculi can be removed through the less dangerous operation of pyelotomy. The question of which method to employ must, in my opinion, depend upon the individual case. If there are many calculi, especially larger ones, and examination of the kidney shows that it requires drainage, it is best to perform nephrotomy. If the calculus is small, and in the pelvis, pyelotomy suffices. In either operation the kidney should, if possible, be delivered upon the back (Fig. 5), and after removal of the stone one should pass a ureteral sound along the ureter to determine its permeability.

Nephrectomy is indicated, provided, of course, that the opposite kidney is functionally normal, first, if the kidney is the seat of a hydronephrosis or pyonephrosis, which has destroyed practically every trace of the parenchyma; secondly, if the calculi are so large and branched that their removal is impossible without serious laceration of the organ; and, third, when the formation of renal calculi accompanies a tuberculosis or neoplasm of the kidney.

Every effort, however, should be made in the case of a hydronephrosis or pyonephrosis to save a kidney unless its retention means a secondary nephrectomy in the near future.

In a calculous anuria an *x*-ray picture will usually show whether the calculi are bilateral, or, if only one ureter is obstructed, upon which side this has occurred. In either case removal of the obstruction is

the only hope of saving the patient's life, and delay is criminal. If it is impossible to secure an *x*-ray picture the history will often indicate upon which side the obstructing calculus is located. In cases, however, where the anuria appears without warning we must judge the side, as in the case shown in Fig. 1, from the side where there is most pain on palpation or more rigidity of the abdominal wall.

In cases with bilateral calculi operation must be performed upon one side at a time. The percentage of recoveries after removal of calculi is rapidly improving, and with early diagnosis and careful attention to every detail, such as testing the functional capacity, skillful technic, etc., the mortality-rate will soon be no larger than is that of cholelithiasis.

DISCUSSION

Dr. W. D. Haines (Cincinnati, Ohio): I have been much interested in the paper read by Dr. Eisendrath, and I think some of the deductions he has drawn are of special value to us, particularly those with reference to the determination of the functional capacity of the opposite kidney. The mistake of operating on a kidney without knowing the condition of the other kidney has been the undoing of several men.

I cannot fully agree with the essayist when he says he would not operate for stone in case he could not find *x*-ray evidence of the stone. I removed a stone from the kidney year before last in the face of the disputing evidence of the *x*-ray. A very competent man made several exposures, and still he could not find a stone; but we had the symptoms of continuous microscopic blood in the urine for quite a period of time. We had pus in the urine, and we had typical colic coming on at various times; and I think with these three symptoms, even though the *x*-ray does not show a shadow, one is warranted, as in this instance, in operating for the removal of stone. While I like the laboratory method of making a diagnosis, and I consider it a great aid, yet we must not get away from making diagnoses outside of the laboratory.

Dr. M. L. Harris (Chicago): This is a large subject. We cannot cover all phases of it; therefore I would like to say a few words on one phase of it, and that is the

Fig. 4. Nephrotomy with clamp in situ and the kidney brought to the surface of the patient's back.

Fig. 6. Nephrotomy wound sutured, with tube for drainage.

diagnosis of parenchymatous stones, not in the pelvis of the kidney, but in the substance of the kidney itself. The clinical history of these cases is often obscure, but with the clinical history which I shall relate in a minute, we should bear in mind the possibility of parenchymatous stone. I have just had such a case, having removed a stone from a man who was sent in with a diagnosis of chronic appendicitis because of the indefiniteness of the symptoms and the fact that he had a little tenderness and more or less pain on the right side.

The patient was a laboring man, and he complained of backache, extending through and down the right side. These cases of continuous, persistent discomfort in the back, which is increased by labor of any kind, should excite suspicion of the possibility of renal stone. In this case, in addition to the indefinite pain or discomfort, repeated microscopic examinations of the urine showed very few red-blood cells, but they were practically constant. With this point before us. the presence of the blood-cells, and the other point of the indefinite or vague sense of discomfort in the lumbar region, high up, led me to take an *x*-ray picture, which showed that the cause of this discomfort was a renal calculus, and operation disclosed a stone in the parenchyma of the kidney, but not communicating with the pelvis.

Dr. B. B. Davis (Omaha, Neb.): Dr. Eisendrath's paper interested me very much. I think it covers the ground very well indeed, and, as a matter of curiosity, I would like to mention a case I had some time ago which illustrates a rather unusual complication we get in these cases. A woman who was pregnant four months came to me from Iowa. She had a movable right kidney, which came away down, and she was having a good deal of pain in the kidney. This pain had come on recently, and she felt it was not a temporary thing due to the position of the uterus, nor did I think so, and I advised against operation. I recommended her to wear a bandage. Examination of the urine at this time showed very few red-blood cells. I told her that if the pain continued, she should come back. Three or four weeks after this she returned, accompanied by her husband, insisting that something must be done. The kidney was still movable, and seemed to be quite tender on pressure, and there were still a few red-blood cells, but no pus, in the urine. The pain was becoming so severe that I thought something should be done in the presence of her pregnancy of four or five months.

Accordingly, I operated with the idea of simply anchoring the kidney, and, much to my surprise, when I drew it out I found a large stone, very rough and lobulated, in the pelvis of the kidney. This was removed and the kidney anchored at the same time. She made a good recovery. Abortion did not occur, and she went to term and was delivered safely at the end of nine months.

Dr. W. W. Grant (Denver, Colo.): I would like to make a few remarks with special reference to the symptomatology or clinical symptoms of stone. A blacksmith from Windsor, Colorado, had been having hemorrhage with pus for six years. During the last two years the hemorrhage and pus were constant, and careful examination showed it came from the left side. I told the skiagrapher (Dr. Childs) that, in my opinion, it was not due to a stone, because the hemorrhage was *too* constant. In stone of the kidney hemorrhage is usually intermittent. Furthermore, in these cases there is usually constant tenderness on deep pressure over the kidney. It was absent. Dr. Childs, in the second examination, discovered a shadow which he thought was not a stone, but which nevertheless was a *pathological* condition.

In operating on this case I found cystic adenoma, which was examined by the pathologist and diagnosed as such. There were a great many very small ones distributed through the kidney, so that it was not deemed wise to leave it, and the kidney was removed. It is now nearly two years since the operation was performed, and the man has been perfectly well since. But I would simply call attention to the desirability of catheterizing the ureteral stump in nephrectomy, as in this case, into the bladder; then with a catheter inserted in the bladder, irrigate the bladder and the ureter. In this way we will discover any obstruction which may exist in the ureter, and, furthermore, it is a good procedure to insure cleanliness.

Dr. Eisendrath (closing the discussion): The main point I wanted to bring out in my paper was to raise the question, Which method of operation is preferable, nephrotomy or pyelotomy? There is a considerable number of stones which, if confined to the parenchyma of the kidney alone, like the case referred to by Dr. Harris, are best removed through a nephrotomy wound, because we can have better access to them. In a certain number of cases we can remove the stone or stones from the pelvis of the kidney, without subjecting the patient to the risk of opening the kidney.

Another point to which I desire to call attention is that we ought, if possible, to fortify ourselves with a complete *x*-ray examination, and without the ordinary full exposure of both kidneys catheterization of the ureters will no longer be practiced. We must take a diaphragm picture of both kidneys and both ureters, and determine, if possible, whether the indications point to the bladder or elsewhere.

THE REMOVAL OF THE GALL-BLADDER

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In 165 operations upon the gall-bladder, liver, and pancreas it was necessary to perform cholecystectomy in twenty-one cases.

The presentation of the histories and pathological conditions will constitute the first part of this paper. In order to be concise I have prepared three charts upon each of which are given the cases, sifted to essential facts, so that those interested may read at their pleasure, and I present only some notes taken from them.

DIAGNOSIS

Pain.—Pain is the most constant symptom. Eighteen cases, Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 20, give histories of recurrent colics, or continuous attacks varying from three days' to months' duration, with soreness or tenderness to palpation and, what is most important, definitely localizing in the gall-bladder. Two cases give histories of right-sided pain without localizing symptoms. Each of these had other abdominal conditions. (See Cases 1 and 21.) One case refused to admit any great dis-

tress except on deep pressure upon a definite tumor of the gall-bladder, which rapidly occurred following a fall from which he sustained other serious injuries. (See Case 7.)

Inflammatory History.—This was obtained in 13 cases. The occurrence may have been remote, recent, or immediate, and we find all of the contracted and useless gall-bladders, the empyemas, and two cases of secondary fistula, one of which might be classed as an empyema, at the first operation. Three of the contracted and useless gall-bladders had also stone in the common duct, all of which gave evidence of chills and high fever. (See Cases 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 16 and 20.)

Tumor.—Seven cases presented a tumor. Pain was very definite, except in the mentioned case of accident, and traced back to a recent attack from which constant distress had continued to the time of operation. All of these cases were empyema or cystic gall-bladders due to cystic-duct obstruction, except Case 6, which was an old thick-walled gall-bladder, felt, however, only under an anesthetic. (See Cases 6, 7, 10, 11, 16, 17 and 19.)

Time.—Histories run over greatly varying periods. Symptoms have been present for 30 (Case 2), 21 (Case 3), and 15 (Case 8) years. All of these have shown the contracted gall-bladder, the result of inflammation, and only come to surgical interference when septic changes or common-duct obstruction occurs. The shortest time was in Case 7, namely, 10 days.

Age.—This ranges from 25 years to 74, or, by decades: Two in the 20; six in the 30; six in the 40; one in the 50; five in the 60; one in the 70. In several of the older patients their first attack occurred in middle life.

Sex.—Four cases were male and 17 female.

Stones.—Stones were not found in the gall-bladder in four cases (Nos. 5, 7, 8 and 14). In Case 8, there was a stone in the common duct, without stones in the gall-bladder. Stones were found in the common duct in three cases (Nos. 2, 3 and 8), and opened once more for exploration in Case 16.

Jaundice.—Six histories give evidence of jaundice. (Cases 2, 3, 8, 13, 16 and 17.) As will be seen, these occurred in all of the common-duct patients and in three others in each of whom a stone plugged the cystic duct.

Perforation.—Perforation has occurred three times (Cases 2, 5, 12), once into the duodenum, once to form a liver abscess, and once to form an abdominal and subphrenic abscess.

OPERATIVE MEASURES

Second Operation.—The gall-bladder was removed at the second operation twice, once when a sacculation was overlooked, and the other where it was impossible during the first operation to dislocate the liver, and although cholecystectomy was indicated, this was postponed on account of the patient's condition.

Drainage.—The cystic duct was tied with gauze or cigarette drain down to the stump nine times. (Cases 1, 5, 6, 7, 11, 15, 17, 19 and 21.) Twice twin tubes were used, one in the cystic duct and the other by its side in the common duct. (See Cases 3 and 4.)

In one case it was impossible to employ these methods, and the forceps was left "in situ" for two days. (Case 18.)

Two cases had a secondary drain through the loin. In all the remaining nine cases the cystic duct was tied.

Pathological Conditions.—Employing the scheme of Mayo Robson (British Med. Journal, 1906, Vol. 1, p.

431), we find the cases classify themselves under the following heads:

1. Cancer and other new growths where disease is local and limited—no case.

2. Contracted and useless gall-bladers, the result of repeated attacks of cholecystitis (Cases 1, 2, 3, 4, 5, 8, 12, 13, 14 and 20)—10 cases.

3. Dilated and hypertrophied gall-bladders, resulting from obstruction in cystic duct: (*a*) always if resulting from stricture (Cases 15 and 21)—2 cases; (*b*) usually if resulting from impacted stones which may have induced ulceration that will eventually lead to stricture (Cases 6, 17, 18 and 19)—4 cases; (*c*) usually if resulting from kinking of cystic duct, or from adhesions—no case.

4. Phlegmonous or gangrenous gall-bladder (Case 7)—1 case.

5. In empyema (Cases 10 and 11)—2 cases.

6. Calcareous degeneration of gall-bladder—no case.

7. Mucous fistula, the result of stricture or other obstruction of cystic duct (Cases 9 and 16)—2 cases.

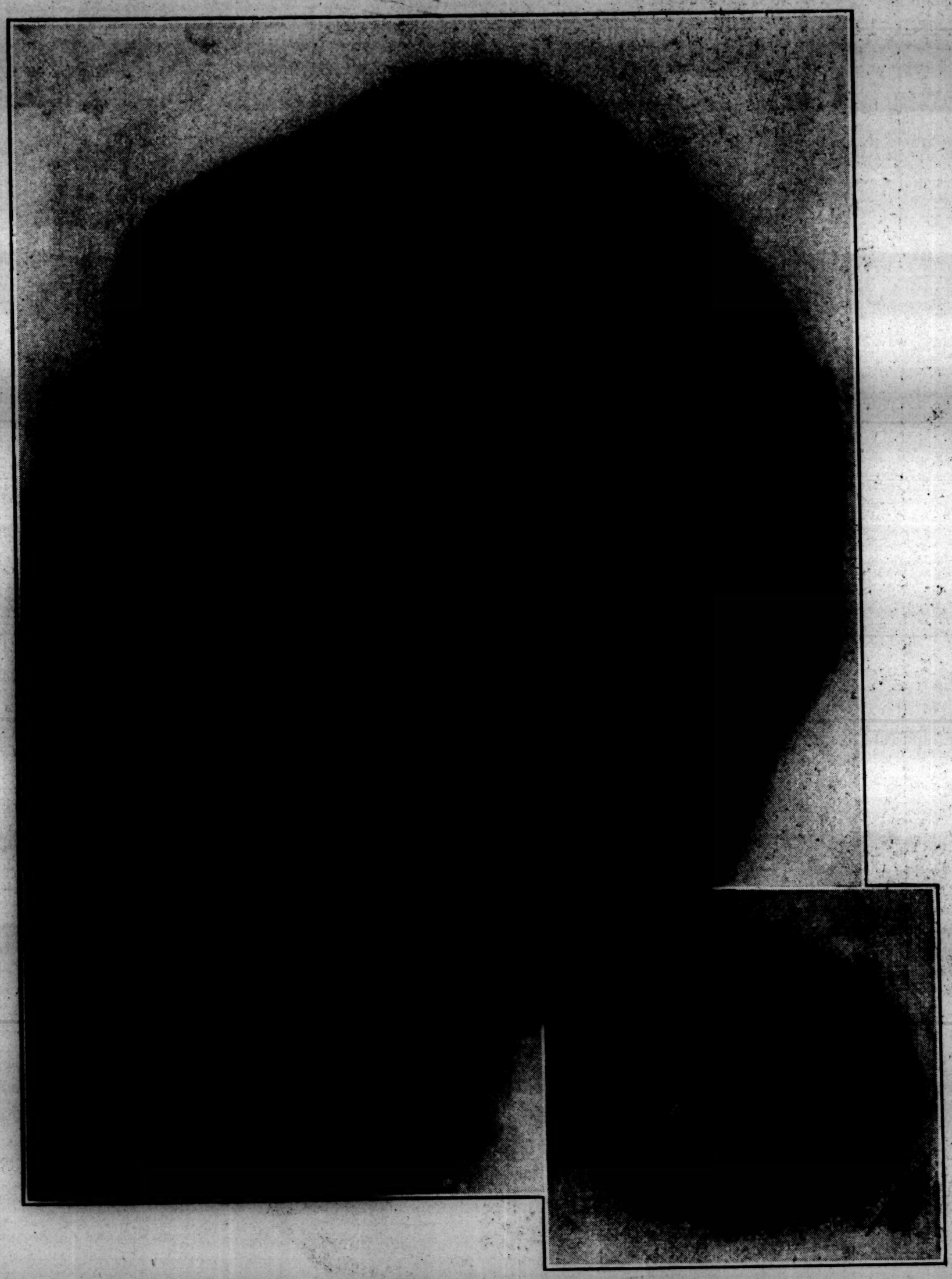
8. Gunshot or other serious injuries of the gall-bladder or cystic duct—no case.

RESULTS

Three deaths have occurred, or 14 per cent plus. (Cases 4, 11 and 14.) Two of these, Nos. 4 and 14, were contracted and useless gall-bladders with marked and recent inflammatory history. The third (Case 11) was an empyema.

Autopsy was done in Case 14. The only information which has been received was to the effect that there was no hemorrhage or inflammation. One case had signs about the gall-bladder three and one-half years following her operation. This was one year ago, and a recent letter reports the patient as well.

Case XVII. 19 months' history, beginning when child was three weeks old. Tumor felt for few weeks. Jaundice. Cystic duct tied. Shows necrotic spots. Changes due to both infection and circulatory interference.



Case XX (large figure). Age 48. Constant pain for four months. Cystic duct drained by tube. Twice the natural size; shows contracted gall-bladder and extraordinary interstitial growth.

Case IV (small figure). Age 60. Shows small gall-bladder contracted tightly on stones. Acute and recent inflammatory history. Natural size.

The other cases have remained well, so far as we are informed, and are among our most grateful patients.

Symptoms of gall-bladder disease are in the majority of cases definite. And while it is not an uncommon fact that we find gall-stones and gall-bladder conditions during the process of other abdominal operations, nevertheless by going over the histories with the patients themselves after the operation has been performed, we can invariably elicit symptoms of their presence. Either the patient has forgotten to mention them in reporting symptoms of other conditions or a misinterpretation has been placed upon them by the questioner.

From the study of these twenty-one cases of gall-bladder removal, we find that all give definite histories, and the operation was undertaken as a primary procedure, except in two cases, where the symptoms were ascribed to other abdominal conditions.

Pain is most constant and may take on many forms. When remittent, colic, in which the pain disappears as suddenly as it occurs, suggests the ordinary gall-stone disease. Pain coming on suddenly or gradually and continuing without definite remission suggests the involvement of the cystic duct. Such a history with the objective signs of tumor, with or without inflammatory reaction, makes a definite diagnosis of an attack of impacted stone. Inflammatory history extending over a period of years usually results in a contracted gall-bladder. Chills and fever is one of our most definite signs of common-duct involvement, although this may occur in empyema or in the initial stages of an acute cholecystitis.

Jaundice occurred in only six cases of these twenty-one gall-bladder cases, three in which the stone was in the common duct and three in the cystic duct, proving that jaundice is merely a sign of obstruction and

has but little other value in the diagnosis of the probable pathological condition present.

It is interesting to note that three of the cases had symptoms for thirty, twenty-one and fifteen years and were in comparative good health, and they practically cured themselves until the common duct had become involved with such severe illness that they were glad to accept surgical relief. We mention this in the belief that these three cases may be used as evidence that gall-bladder conditions, sometime or other in the vast majority of cases, will demand surgical relief.

The gall-bladder was removed in three cases in which the common duct was involved, but were all of the contracted and useless type, and when it would have been impossible to have used them in any subsequent operation, if it had been found necessary to perform such. We believe in leaving the gall-bladder in common-duct cases for the purpose of cholecystenterostomy if indicated.

In nine cases the cystic duct was drained and in nine it was tied. We believe that both procedures are correct, and are to be selected by the operator for the individual cases.

Two cases were operated upon the second time, and it was a matter of comment that, although the work of the surgeon was very difficult, the patient withstood the operation much better than the first.

The greatest interest in the pathology of the gall-bladder is contained in the gross changes. Although each specimen should be studied histologically for malignancy, such investigations usually result in demonstrating different degrees of changes resulting from infection or circulatory interference. No specimen of our series was removed until it was definitely shown that the function of the organ was irreparably damaged.

H. P. RITCHIE.

It is difficult to lay down rules by which one may know when a gall-bladder should be removed, and when it should not. The fear that a certain patient might some time in the future have to undergo another operation, and that such an occurrence would be considered a surgical blunder on the part of the operator, has been the cause of removal of many organs which might otherwise have been saved. To prove that considerably diseased gall-bladders recover and give no trouble for long periods of time, let me quote a few cases:

Case 1.—This case, operated upon in 1899, had a somewhat contracted gall-bladder, containing thirty medium-sized, old black stones, no bile, and at least one drachm of thick pus. She had a stormy convalescence and was not well until three months later, when she passed from the fistula another stone, evidently overlooked at the time of the operation. She reports herself as perfectly well today, having had no trouble since her operation, nearly ten years ago.

Case 2.—Mrs. H. A cystic gall-bladder where from the history I was led to believe that the cystic duct must have been obstructed by stones for three weeks, operated upon nine years ago; perfectly well today.

Case 3.—Miss L. Case of Dr. Frost's cystic gall-bladder, one ounce of clear fluid, not even bile-stained, and three large stones; no trouble after two years.

Case 4.—Mrs. C. Small, contracted, universally adherent, thick-walled gall-bladder, necesitating digital dilatation before I could remove three moderate-sized stones from the cavity; one stone also removed from the common duct. This operation was in September, 1901. She lived five years, never having any further trouble from her gall-bladder, and died from cerebral embolism.

Case 5.—Mrs. McN. Operated upon in October, 1901; chronic cholecystitis; gall-bladder contracted and adherent; one small stone in the gall-bladder; she passed a similar stone a few days before. At the time of the operation I thought she had a carcinoma of the pancreas from the size and stony hardness of that organ. *Fortunately,* I drained

her gall-bladder, and *that night* found Mayo Robson's first reprint on chronic pancreatitis. She has been perfectly well ever since her operation.

CASE 6.—Mrs. M. Operated upon in April, 1900; gall-bladder thickened and adherent. One hundred and ninety-six stones were found; one moderately sized stone was wedged in the cystic duct; after the operation there was no discharge of bile, and a fistula resulted. Ten months later a stone was found and removed from the common duct. It was noted at that time that the gall-bladder was thickened and adherent. Six years later, or in January, 1907, she came to me with a tumor in the region of the gall-bladder, saying that she had been quite well, but had been suffering pain in the gall-bladder region for the past three or four months. An exploration demonstrated carcinoma of the gall-bladder, mesenteric glands, and liver which could not be removed. She lived only a few months.

CASE 7.—D. A. F. had been sick two weeks with typhoid; five days before the operation he had chills with a temperature of 105°, followed by a slight jaundice, with a tumor in Robson's point; acute cholecystitis and cholangitis and empyema of gall-bladder; 130 stones, one the size of a small hen's egg, impacted in the cystic duct. Two weeks later he gave a positive Widal's reaction. His typhoid gradually subsided, lasting in all over six weeks. He had wound suppuration, and except for a ventral hernia has been perfectly well ever since, gaining sixty pounds in the next year. Two years later I operated upon this man for ventral hernia. At that time I had a chance to examine his gall-bladder. There was no apparent disease or re-formation of stones, in spite of the fact that the gall-bladder was adherent to the anterior abdominal wall and to the duodenum.

CASE 8.—Mrs. B. had a very large gall-bladder, the size of a baby's head with a dark necrotic spot in the fundus; no bile in the gall-bladder; the bile commenced to flow on the seventh day.

I can also recall several cases when after drainage of the cystic gall-bladder and removal of the obstructing stones in the cystic duct, the bile did not commence to flow from the drainage tube until the fourth or even up to the seventh day, and still the patients recovered, and most of them had no trouble of any kind from the gall-bladder since.

Of course, there are cases in which the gall-bladder is so markedly diseased that there is no question as to the necessity of removal, for instance, in carcinoma, extensive gangrene, or calcareous degeneration. Anyone, no matter how limited his experience, would know that such gall-bladders ought to be removed. But how about the border line cases? the cystic gall-bladder where the stone has been impacted only *a few days?* when only *a small* spot of gangrene affects the fundus of the gall-bladder? or a *moderate-sized* perforation exists? These are the cases in which it is difficult to decide what is best to be done. In Mr. Moynihan's last book he takes the position that cholecystotomy is a drainage operation, and that by doing a cholecystectomy he removes the necessity for drainage. He says that he is coming to the belief that cholecystectomy should be done more frequently. I should feel perfectly safe to have any member of my family in Mr. Moynihan's service and know that he would receive the very best care, but when other operators of less experience and less skill go further than Mr. Moynihan and advise the removal of every cystic gall-bladder and almost every gall-bladder containing gall-stones, it seems well to call a halt. My experience is limited, but when such men as Mayo, Deaver, Richardson, and Murphy, and a host of others, agree that the mortality of cholecystectomy is greater than cholecystotomy, and that in case of future trouble it is safer for the patient if his gall-bladder has not been removed, I feel that Deaver is right when he says: "In case ot doubt, *drain.*"

Mayo makes this point very strong in his last article read before the Mississippi Valley Medical Association in October last, when he states that 7.6 per cent of their gall-bladder cases have shown complicating inflammations of the pancreas, and that on account of the difficulties of secondary drainage where the gall-

bladder has previously been removed, he removes only the gall-bladder in the presence of pancreatitis when there is malignant disease of the gall-bladder or permanent obstruction of the cystic duct. He also says that he has come to the conclusion that in such cases, especially if there is a dilatation of the common duct, a much larger proportion of cases, with or without stones, should be treated by cholecystenterostomy than has been the custom in the past. The adhesions which form after any gall-bladder operation are often very dense and very extensive, more so after cholecystectomy than after the simple operation of cholecystotomy.

To illustrate the difficulties in a secondary operation on the gall-bladder:

Mrs. B. Six weeks before I saw her commenced to have a high temperature and chills with intermittent jaundice. After the most careful search I could not find a stone in the common duct, although I was sure that I was going to find one. There was a cholecystitis with extensive adhesions, ten old black stones, and bile in the gall-bladder. I performed cholecystotomy. The fistula would not close; when there was an attempt at closure, she would have chills and high fever again. Four months after the first operation, the patient having been confined to the hospital and in bed the most of the time, I made a diagnosis of obstruction to the common duct, probably stone, and opened her again. I found a large dilated gall-bladder containing fully a pint of bile, and universal and very dense adhesions. After tearing the liver, breaking up some of the adhesions, and not being able even to demonstrate the stomach or the duodenum, let alone the common duct, on account of the profuse hemorrhage, in order to get her off the table alive I had to make a cholecystenterostomy with the transverse colon with a button. She was much improved for six months when the fistula gave evidence of closing. She refused any further operation. The gall-bladder was ruptured, and she died of peritonitis.

It would have been better for this patient perhaps if I had used a suture instead of the button, but the suture-openings also tend to close. It seems as though there was too little material passing through these false openings to keep them

open, and they are especially apt to close if there is any traction upon the point of union.

Concerning the mortality of cholecystectomy: Mr. Moynihan says that in judicially selected cases the risk is not greater than after cholecystotomy, and that in several cases the operation was simpler than in cholecystotomy.

The mortality of cholecystectomy, like that of any other operation, is due to that man's own experience. We are apt to look at the record of others and tell our patients that the dangers of such and such an operation are reduced to two or three per cent, forgetting that the man whom we are unconsciously quoting has attained his two or three per cent only by a greater experience than our own, but no doubt through bitter trials and losses which ought not to have occurred. Mayo Robson, in 1904, in his third edition, reports 28 operations for cholecystectomy with 4 deaths, or 14.2 per cent mortality. My own is 21 with three deaths, or 14.2 per cent mortality. My mortality is high at this time. Robson's was not high four years ago. At that time Mayo's was 6 per cent; Terrier's, 25; Crovoisierer's, over 25 per cent; Delageier's, 23 per cent; while Mayo's today is less than 2 per cent in his last 500 operations.

An irrelevant point in the general mortality of gall-bladder cases was impressed upon my mind in studying up my statistics for this paper, namely, that three deaths have occurred in a series of twenty combined operations where, in the presence of some pelvic tumor, gall-stones have been found and removed at that time through a stab wound over the gall-bladder, instead of making a secondary opening or putting them off to a better and safer time. One of these cases died as a result of a secondary bleeding from a myomectomy wound, and the death, I am sure, had nothing to do with the gall-bladder operation, but as the two were

combined, they must stand the death in truthful statistics, because I may have been mistaken in this opinion, and there was no mistake about the woman's death.

I have recently come to the conclusion that the removal of gall-stones through a stab-wound is seldom justifiable, and that only under the most favorable conditions will I ever do it again.

The principal reason in my mind for writing this paper is to impress the young man who is thinking of starting in gall-bladder surgery with the fact that the mortality of gall-bladder operations will not *be two per cent* in his hands, and is not likely to be anywhere near that point until he has done several hundred gall-bladder operations.

Then, in conclusion, let me state the negative side of this question: Under what circumstances should we not perform cholecystectomy?

1. In a cystic gall-bladder when, from the appearance and the history, it is quite certain that the obstruction of the cystic duct is recent, even though the gall-bladder does not contain bile.

2. In calcareous disease or gangrene of a small portion of the fundus of the gall-bladder.

3. In moderate-sized perforations or wounds.

4. In moderately adherent and "somewhat" contracted gall-bladders.

5. In the presence of pancreatitis, especially if complicated with dilatation, stone, or other disease in the common duct.

A. MacLaren.

FOR DISCUSSION, SEE PAGE 263

No.	Sex	Age	Recent History	Previous History	Date of Operation	Op. Procedures	Pathologic Conditions	Convalescence	Result
1	F.	49	Never pregnant. "Inflammation of bowels" soon after marriage. Credit, Dr. Townsend, Decorah, Ia.	Colic one year ago. Found tumor in abdomen growing worse.	Sept. 22, 1903, at St. Luke's.	Hysterectomy, appendectomy, cholecystectomy. Gauze drain to stump of duct and in raw surface of liver.	Pedunculated and interstitial fibroids. Cystic appendix and mucopus gall-bladder walls thickened. Packed with stones. No bile. Stone impacted in cystic duct.	Immediate and uneventful. Recovered.	Jan. 22, 1908. Cured.
2	F.	61	Four children, youngest 23. Thirty years ago severe colic for several years, then free for 20 years. Credit, Dr. Gervino Bulston.	Recently, jaundice; clay-colored stools and constant distress.	Mar. 18, 1904, at St. Luke's.	Cholecystectomy. Choledochotomy tube into common duct.	Cholecystitis. Perforation into duodenum. Dense adhesions. Three stones in common duct. One stone at lower end of duct crushed with finder and detritus scooped out.	March 20, bile flowing freely. March 26, clay colored stools. Recovered.	Oct. 11, 1904, burning in wound. Dec. 12, 1907, some signs of obstruction. Dec. 1, 1908, well.
3	F.	51	Never pregnant. First severe attack 21 years ago. Few mild attacks before marriage. Credit, Dr. Hopkins, Cumberland, Wis.	For last 15 years slight attacks "off and on" during last few weeks. Chills and fever and jaundice.	Mar. 29, 1904, at St. Luke's.	Appendectomy, cholecystectomy, choledochotomy, common duct entered and drained through cystic duct.	Chronic obliterative appendicitis, chronic obliterative cholecystitis. Gall-bladder size of cherry. One stone in common duct.	Severe emesis for 3 days. Recovered.	Dec. 12, 1904, gained 37 lbs. Pain in side, Nov. 10, 1905. Gained. May 13, 1907; cured.

No.	Sex	Age	Previous History	Recent History	Date of Operation	Op. Procedures	Pathologic Conditions	Convalescence	Result
4	F.	60	Several children. Well, active life. Credit, Dr. Nickerson, Glencoe.	Denies gall-bladder symptoms until 2 weeks ago and when taken with chills, fever and evidence of local peritonitis, very ill upon arrival at hospital. Watched 2 weeks before operation.	Oct. 6, 1904, at St. Luke's.	Cholecystectomy, common duct split and explored with probe down to intestine. No stones in common duct. Duct drained with tube and gauze. One gall stone through kidney pouch.	Chronic obliterative cholecystitis. Dense adhesions. Gall-bladder small and full of stones. See Specimen. Fig. 3.	Never rallied.	Died Oct. 7, 1904.
5	M.	25	Operation Sept. 12, 1904, for acute appendicitis, followed by frank lobar pneumonia, very ill. Recovered, well 2 months. Credit, Dr. Ramsey, St. Paul.	Two months following appendectomy, had frank attack of cholecystitis with pain and fever localising in gall-bladder region. Vomiting continuous. No jaundice.	Apr. 6, 1905, at St. Luke's.	Cholecystectomy. Cystic duct dilated. Resected rib.	Perforation of gall-bladder forming liver abscess. No stones. No bile. Bladder walls thickened.	Vomiting continued violent 6 days. April 12, 1905, posterior gastro-enterostomy.	Recovered. Fistula some months. Nov. 1, 1905, in perfect health.
6	F.	40	Four children. Many attacks of gall-bladder colic, otherwise well. Credit, Dr. Kilbride, Canby, Minn.	Last attack 4 weeks ago. Pain and local tenderness ever since. Tumor under anesthesia.	May 2, 1905, at St. Luke's.	Cholecystectomy. Cystic artery and duct ligated. Two gauze drains tied in place with ligature.	Chronic cholecystitis. Stone impacted and stricture of cystic duct. Ten small yellow gall-stones. Gall-bladder thick-walled, containing brownish viscid fluid.	Slight suppuration about drain.	Recovered.

No.	Sex	Age	Previous History	Recent History	Date of Operation	Op. Procedures	Pathologic Conditions	Convalescence	Result
7	M.	60	Well, vigorous life. Recently married. Young family. Credit, Dr. Clark, White Bear.	While shingling roof fell to ground and sustained comminuted fracture of left elbow and ramus pubis. While convalescent had severe pain over gall-bladder with development of tumor.	June 26, 1905, at St. Joseph's.	Cholecystectomy. Drain to stump of duct with gauze.	Gangrene of gall-bladder filled with blood and under great distension.	Uneventful and immediate. Recovered.	Jan. 28, 1907. "Never felt better in his life." Nov. 1, 1908, well.
8	F.	66	Widow 18 years. Children. 15 years ago had attack like this, Credit, Dr. Crommelt, Amory, Wis.	Three months has had jaundice, chills and fever.	Sep. 1, 1906, at St. Luke's.	Appendectomy. Cholecystectomy, choledochtomy. Stone removed. Tube in common duct.	Chronic appendicitis. Gall-bladder small and thickened, full of putty-like material. Stone in common duct.	Rapid and uneventful.	Recovered.
9	F.	40	Has several children. History of gall-bladder inflammation. Credit Dr. Kelly, Canby, Minn.	On Sep, 19, 1906, cholecystectomy was done. No stones found. A week following, discharged several stones. Distress constant.	Oct. 23, 1906, at St. Luke's.	Cholecystectomy. Drainage of cystic duct stump with tube.	Valve-like curtain of m. m. at opening of cystic duct allows bile to enter, but not to leave. M. m. granular.	Nov. 9, 1906. Colic. Recovered.	Cured.

No.	Sex	Age	Previous History	Recent History	Date of Operation	Op. Procedures	Pathologic Conditions	Convalescence	Result
10	F.		Attack of colic, 14 years ago. Several colics since. Credit, Dr. Hunt, Northfield.	Last 10 days tenderness over gall-bladder. Temp. 103°, tumor ever since.	Nov. 21, 1906, at Northfield.	Cholecystectomy. Gall-bladder divided to cystic duct. Liver torn. Tube drain in stump of duct. Three gauze strands. Appendectomy.	Chronic appendicitis; empyema of gall-bladder, 25 stones. One in cystic duct.	Uneventful.	Cured.
11	F.	61	Was operated on May 25, '06, for complete procidencia. Attack July, '07, pain and fever. Sick several days.	Attack beginning Feb. 22, '07, continuous to date. Tumor.	Mar. 13, 1907, at St. Luke's.	Cholecystectomy. After aspiration of gall-bladder. Drained by gauze down to stump through stab wound.	Empyema gall-bladder. Thick pus. Adhesions about gall-bladder. One stone in cystic duct.	Very sick; nausea and vomiting. Sudden profuse flowing of bile.	Died April 16, 1908. Peritonitis and bile poisoning.
12	M.	45	Abdominal abscess opened which discharged bile in a few days. Second operation in which large subphrenic abscess was drained thro' pleural cavity. Well for months, but returned because of colic.	One colic but some constant distress over gall-bladder since operation.	April 3, 1907, at St. Luke's.	Cholecystectomy. Tube drain of cystic duct.	Chronic obliterative cholecystitis with extensive adhesions of gall-bladder and liver.	Uneventful and immediate.	Recovered. Oct. 1, 1908; cured.

No.	Sex	Age	Previous History	Recent History	Date of Operation	Op. Procedures	Pathologic Conditions	Convalescence	Result
13	F.	45	One child, 18 yrs. Several mild attacks. Credit, Dr. Talbot-Jones, St. Paul.	Severe attack Jan., '07, lasting 27 hours. Temp. jaundiced, sick ever since.	July 9, 1907, at St. Luke's.	Appendectomy, cholecystectomy. Tube in stump of cystic duct.	Chronic appendicitis; chronic cholecystitis. Gall-bladder, liver and surrounding peritoneum, hard and indurated, suggesting malignancy. One stone in cystic duct. Gall-bladder contained necrotic tissue and granulation.	Jaundiced several days.	Recovered. Oct. 9, 1907, gained 20 lbs. July 1, 1908, cured.
14	F.	36	Three or four previous attacks of gall-bladder disease and usually very sick. Credit, Dr. Merrill, Stillwater.	Present attack September 1, '07. Chills, temperature 104° and signs of peritonitis.	Oct. 26, 1907, Stillwater, City Hospital.	Cholecystectomy. Tube and gauze through stab wound.	Cholecystitis, obliterative. Gall-bladder very small. Dense adhesions. No bile. No stones.		Died in 36 hrs. Post-mortem. No bleeding or inflammation.
15	F.	45	Married 8 years. No children. Gall-bladder colics began 2 years ago.	Recurrent colics. Considered the operation a long time.	Nov. 5, 1907, at St. Luke's.	Cholecystectomy. Cystic duct ligated. Stranda tied in.	Chronic cholecystitis with 6 small stones. Ulcer encircling m. m. of cystic duct. A little bile in gall-bladder.	Persistent vomiting for 6 days.	Recovered. Dec. 7, 1908, well.

No.	Sex	Age	Previous History	Recent History	Date of Operation	Op. Procedures	Pathologic Conditions	Convalescence	Result
16	M.	74	Biliary colic with chills, lasting over a year. Nephritis, jaundice. Credit, Dr. Parks Ritchie, St. Paul.	Operated May 4, '07, to find cholecystitis with large thickened gall-bladder, peritonitis, 3 large and 22 small stones. No stones in cystic duct. Gall-bladder should have been removed but deemed inadvisable. Wound supp. continuation of chills and colic.	Jan. 2, 1907, at St. Luke's.	Cholecystectomy, dividing gall-bladder from fundus to common duct, which was explored with scoop. No stones.	Cystic gall-bladder; unusual dense adhesions; no stones; enucleation of gall-bladder at cystic duct.	Stormy wound supp. nephritis in severe degree.	Recovered. Dec. 9, 1908, well.
17	F.	29	Well until 19 months ago, when colics began, when last child was 3 weeks old. Colics recurrent but distress all the time. Credit, Dr. H. C. Johnson, St. Paul.	Growing worse. Tumor felt last few weeks. Jaundice, Jan. 26, '06.	Jan. 26, 1906, at St. Luke's.	Cholecystectomy. Cystic duct tied. Gauze drain through stab and through liver. Appendectomy.	Cystic gall-bladder thick-walled with necrotic spots. Stone in cystic duct. None in common. Ch. appendicitis. Three enteroliths.	Easy and uneventful.	Recovered. Well.

No.	Sex	Age	Previous History	Recent History	Date of Operation	Op. Procedures	Pathologic Conditions	Convalescence	Result
18	F.	34	Operation upon July 2, '04, for pelvic abscess following miscarriage, tedious convalescence. About a year following began having colics, growing worse. No temp. Credit, Dr. A. Whitcomb, St. Paul.	One recent attack lasted 10 days, worst of all.	Mar. 2, 1908, at City Hospital, St. Paul.	Cholecystectomy. Very difficult, could not dislocate liver. Clamp on cystic artery and duct. Left gauze drain, March 4, '08, forceps removed.	Gall-bladder red with necrotic spots. Adhesions all over liver. No bile, 126 stones, one in cystic duct.	No bile until removal of clamps with sudden flooding of bile.	Recovered. Well.
19	F.	30	Two children, youngest still nursing. Indigestion past year. Credit, Dr. J. S. Kilbride, Canby, Minn.	Present attack began 10 days ago, soon noticed tumor.	May 22, 1908.	Cholecystectomy. Tube and gauze drain to stump, but cystic duct tied.	Cystic gall-bladder. Stone in cystic duct. Thirty stones. Muco-pus. Gall-bladder wall thick and necrotic.	Chill. Temp. 104° evening of op. One day only.	Recovered. Well.
20	F.	48	Thirteen children. Operated for acute supp. appendicitis 9 months ago. Credit, Dr. J. S. Kilbride, Canby, Minn.	Constant abdominal distress since operation. Evident ventral hernia at site of app. wound.	Aug. 5, 1908.	Herniotomy, appendectomy, cholecystectomy. Cystic duct drained.	Thick-walled gall-bladder contracted down upon 500 old stones.	Erysipelas infection about wound.	Recovered.
21	F.	39	One child. Pain in right side last year. At no time colics, Lac. C. & P. Retrodexion.	Considered operation some time.	Oct. 3, 1908.	Repair C. & P. Ventro-suspension. Cholecystectomy. Op. Procedures	Gall-bladder condition found by intra-abdominal examination. Gall-bladder full of stones, one about to come through; cystic duct obliterated. No bile.	Immediate and uneventful.	Recovered. Well.

SOME POINTS IN THE SURGERY OF THE BILE TRACTS, DESCRIBING A NEW INCISION THROUGH WHICH TO REACH THEM AND PRESENTING A NEW INSTRUMENT TO FACILITATE THE REMOVAL OF STONES FROM THE FIRST PORTION OF THE COMMON DUCT

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The three incisions usually mentioned in connection with surgery of the bile-tracts are Mayo Robson's, Bevan's, and Kocher's. (Fig. 1.)

Mayo Robson's incision makes a continuous opening down through the abdominal wall the entire length of the incision, injures the right rectus muscle, and endangers the nerve supply to its inner portion.

Bevan's incision makes a continuous opening down through the abdominal wall the entire length of the incision, and it must cut across the intercostal nerves because it extends along the linea semilunaris, which the intercostal nerves cross just before they enter the rectus muscle.

Kocher's incision makes a continuous opening down through the planes of the abdominal wall, and it must cut across the intercostal nerves because it is almost at a right angle to their course. It also cuts across

the muscle fibers of the three great side muscles of the abdominal wall, the external oblique, internal oblique, and transversalis. Kocher's incision falls apart easily and gives ready access to the right upper abdomen.

The incision I shall describe falls apart in a manner similar to Kocher's, but does no damage to any muscle and does not cut across any intercostal nerves.

A year ago at the meeting of this Association in St. Louis I presented a paper on "The Abdominal Incision" in which I mentioned a new incision for the upper abdomen (Surgery, Gynecology, and Obstetrics, April, 1908). At that time my experience with it was rather limited, but more experience with the use of it encourages me to describe it more fully in this paper.

The incision for the bile-tracts begins at the inner edge of the right rectus muscle one or two inches from the ensiform cartilage, and extends diagonally downward and outward to the outer edge of the right rectus close to the level of the umbilicus. It cuts through the skin, fat, and anterior wall of the sheath of the rectus (Fig. 2). A short transverse incision about one inch in length may be made inward from the upper end of the diagonal incision through the skin, fat, and linea alba; and a similar one through the linea semilunaris at the lower end. In case more room is required the upper transverse incision may be extended further into the anterior and posterior walls of the sheath of the left rectus. The rectus muscle is then separated from its sheath. It is easily separated from the posterior portion of its sheath by blunt dissection, but the anterior portion presents some difficulty at the insertion of the lineæ transversæ (Fig. 4), one of which is found about midway between the ensiform cartilage and the umbilicus, and is crossed by this incision. The attachment of the

Fig. 1. A, Kocher's incision. B, Bevan's incision. C, Author's incision. D, Mayo-Robson's incision.

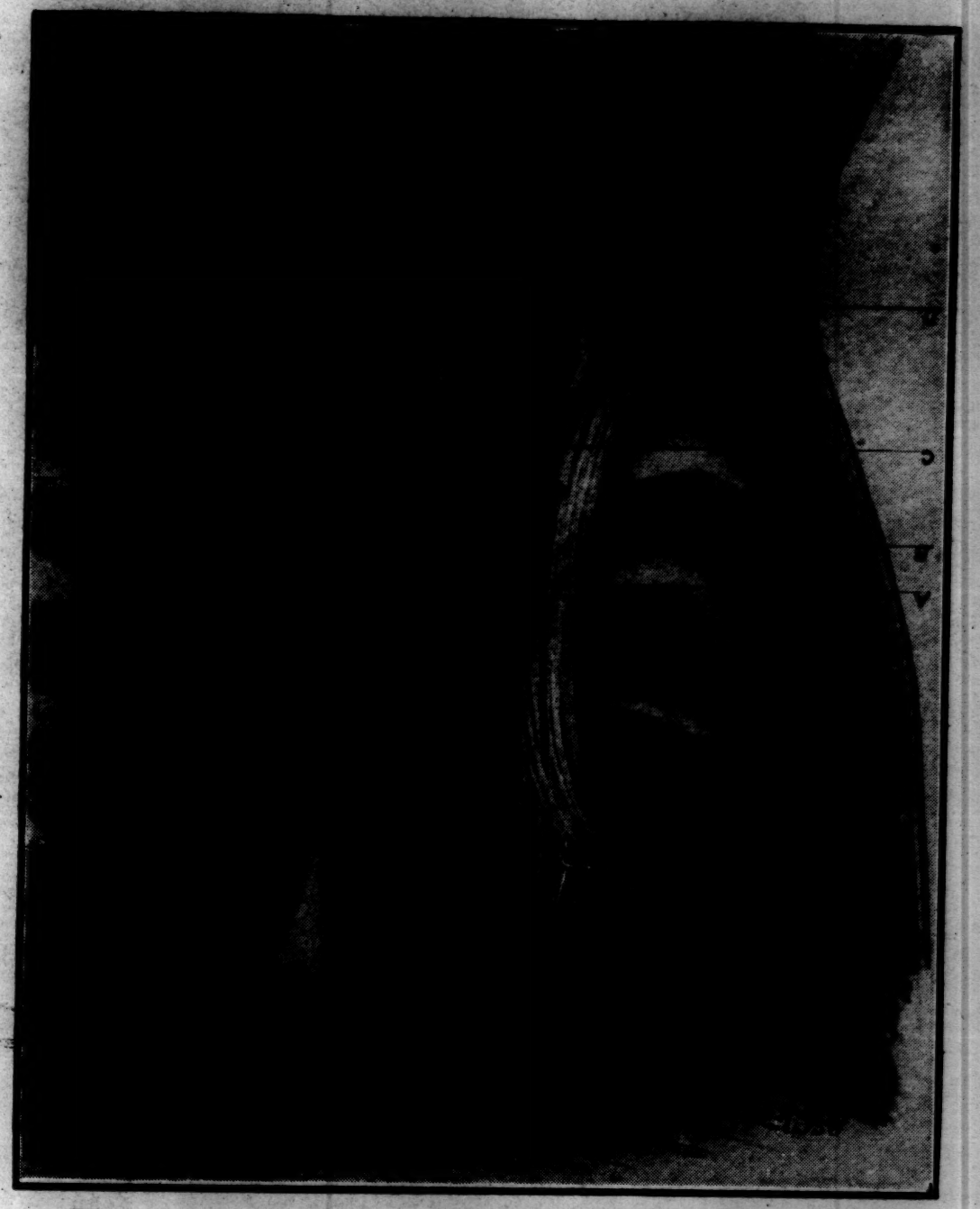

Fig. 2. A, Anterior wall of sheath of rectus muscle. B, Posterior wall of sheath. C, Rectus muscle. D, Intercostal nerves. The direction of the incision through the skin, fat, and anterior wall of the sheath of the rectus muscle.

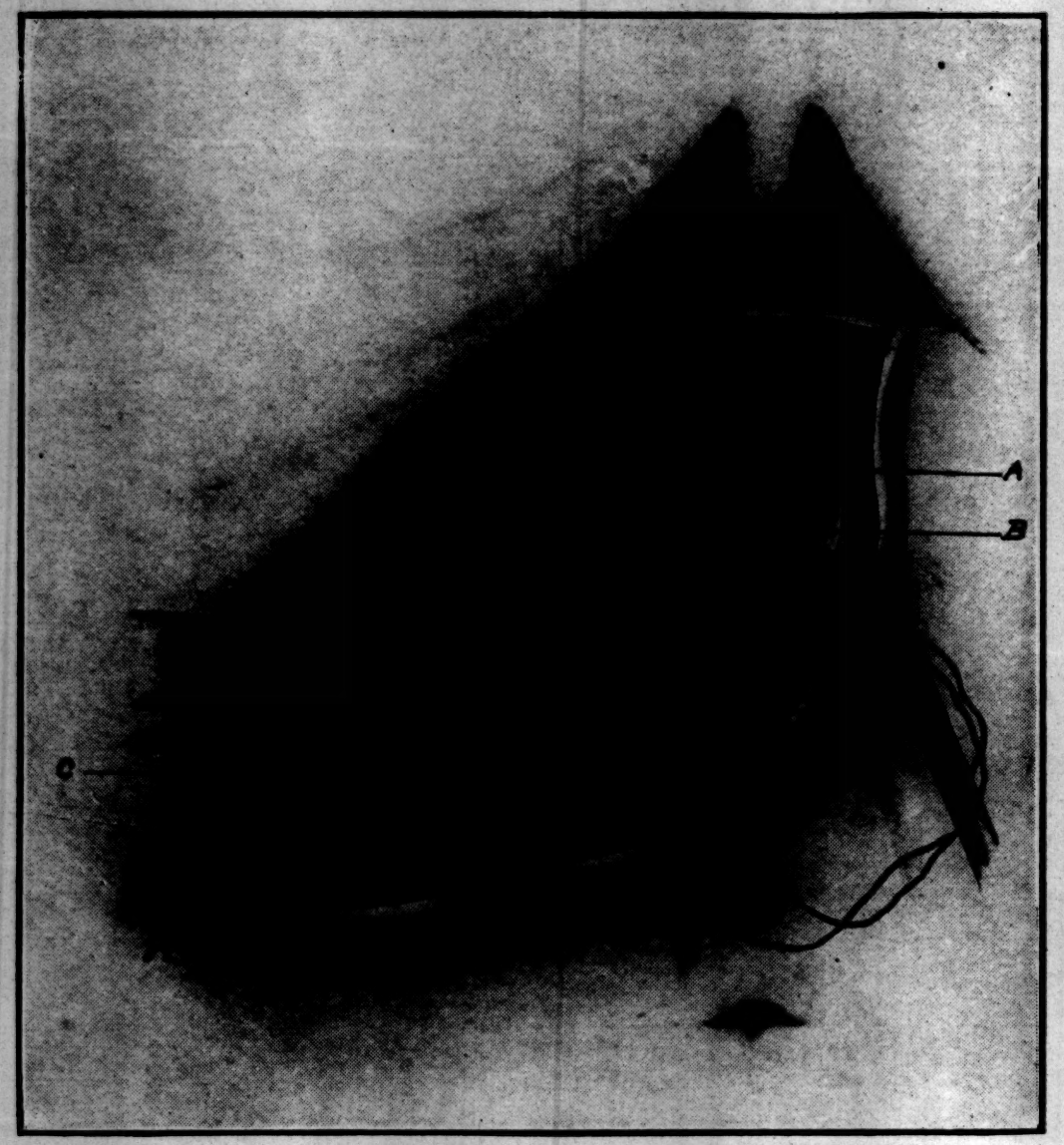

Fig. 3. A, Posterior wall of the sheath of the rectus muscle. B, Anterior wall of the sheath. C, Rectus muscle retracted outward. The diagonal incision in the posterior wall of the sheath is sutured around the drain, beginning at the outer end.

Fig. 4. A, Anterior wall of the sheath of the rectus muscle. B, Rectus muscle. C, A linea transversa, the only place where sharp dissection is necessary to free the rectus muscle from its sheath. After the diagonal incision in the posterior wall of the sheath is closed the same suture is used to close the short transverse incision in the linea alba and the diagonal incision in the anterior wall of the sheath. The rectus muscle is held to the outer side by the drain. When the drain is removed the muscle slides over into its place and throws a barrier across the drainage tract.

muscle to the anterior wall of its sheath is very close at this linear transversa and requires sharp dissection with knife or scissors.

When the muscle is thoroughly freed from its sheath, except at its outer border, it is easily retracted outward and allows the posterior wall of its sheath and the peritoneum to be incised in the same direction as the skin and anterior wall (Fig. 3). The upper end of this diagonal incision through the posterior wall extends into the short transverse incision across the linea alba. When this last cut is made the incision falls open and gives ready access to the right upper abdomen. Any operation on the bile-tracts may be done through it, and it easily permits of operations on the stomach, such as gastro-enterostomy, pyloroplasty, and resection of the pylorus (Fig. 6). So far we have not found it necessary to adopt Mayo Robson's expedient of elevating the spine when this incision is used.

The advantages of this incision are:

First. There is not a continuous opening down through the planes of the abdominal wall. As the opening is not continuous the closure will be stronger. The openings through the aponeurotic structures of the anterior and posterior walls of the sheath of the rectus muscle are thoroughly protected by the uninjured muscle which lies between them.

Second. The intercostal nerves that supply the muscle are not interfered with in any way as they enter the muscle through its outer border (Fig. 2).

Third. It makes a stronger closure where drainage is required. The drainage-tube or gauze holds the muscle to the outer side. When it is removed the muscle tends to slide over to its former bed and thus places a barrier of uninjured muscle across the drainage tract.

Fourth. No injury is done to the muscular struc-

ture. The only cut made across the fibers of the aponeurotic structures is that across the fibers of the aponeurosis of the external oblique, which helps to form the anterior wall of the sheath of the rectus. The cut in the posterior wall of the sheath is in the general direction of the fibers of the internal oblique, the strongest side muscle of the abdominal wall.

After the operation is completed the edges of the incision are easily co-aptated and sutured without tension (Figs. 3 and 4).

It is the custom of most surgeons, I think, when the lower abdomen or pelvis is opened to pass the hand through the incision up to the gall-bladder and examine it, just as it is the rule also to examine the appendix. In case the gall-bladder contains stones and is of normal size so that its fundus can be easily brought up to the abdominal wall, another method of incising may be used to advantage.

A short incision, one and one-half inches long, may be made longitudinally over the gall-bladder about an equal distance from the outer and inner edges of the right rectus muscle. This incision cuts through skin, fat, and anterior wall of the sheath of the rectus. Forceps are thrust through the muscle, and the jaws are spread. This splits the fibers of the muscle longitudinally and exposes the posterior wall of the sheath. The forceps are then thrust through the posterior wall of the sheath and peritoneum, and the jaws spread. This splits the fibers of the posterior wall of the sheath diagonally from above downward and outward in the direction of the fibers of the internal oblique muscle.

It will be readily seen that this makes a small grid-iron incision which tends to close itself as soon as it is permitted to do so. A finger passed through this incision locates the fundus of the gall-bladder, and forceps passed along the finger seizes it and brings it

up. The gall-bladder may be incised, the stones removed, and a drainage-tube inserted which is secured by one or two purse-string sutures. No sutures are needed for .the incision which will close promptly when the drainage-tube is removed.

When the gall-bladder is examined through the original incision in the lower abdomen care must be taken to see that the stones are free and movable in the cavity of the gall-bladder and that none are fastened in the cystic duct. Stones impacted in the cystic duct cannot always be felt from inside the gall-bladder. In any operation for the removal of gall-stones after all the stones seem to be removed the finger should be passed along the outside of the gall-bladder and ducts to make sure that no stones have been overlooked. A failure to do this in my early operations has caused me the humiliation of having to operate again in two cases and remove an overlooked stone in the cystic duct. The small incision described above does not permit this final examination to be made, so it must be definitely ascertained that no stones are impacted in the cystic duct at the preliminary examination through the original incision.

I also wish to present a forceps to aid in removing stones from the first portion of the common duct. Most of the stones found in the common duct are in the first portion or have a dilated duct behind them, which allows them to be pushed back into the first portion.

The usual procedure is to grasp the stone between the thumb and index finger and endeavor to hold it steady while the duct is incised over it. It is difficult to do this without making pressure on the portal vein, which Ransohoff (Annals of Surgery, October, 1908) has shown produces a rapid fall in the blood-pressure and shock. The hand and wrist are in the incision and occupy part of the room needed for the manipula-

tion of instruments in the other hand. When the stone is removed the bile flows out freely and must be mopped up quickly because it usually contains some infectious organism. After the stone is removed it is difficult to hold the duct so as to suture it or fasten a drain to the incision in it. Sometimes the stone is elusive and difficult to hold with the thumb and finger.

It was this difficulty on one occasion that caused me to devise this special forceps. The following is taken from the record of the case:

"The patient was very fleshy. A small stone was felt in the common duct. In making an effort to hold the stone steady between the thumb and finger so that the duct could be incised, it slipped suddenly back into the hepatic duct and all efforts to find it were fruitless. The common duct was opened, and a drain fastened to it."

That others have had the same experience is shown by a case reported by Dr. D. A. K. Steele (Annals of Surgery, February, 1905). In describing an operation to remove a stone in the common duct he says:

"There was one large stone found in the common duct of the ball-valve variety, and which was doubtless responsible for the recurrent attacks. I thought, as it lay in a dilated pouch in the common duct, I could readily extract it by pushing it up through the cystic duct into the gall-bladder, thus avoiding an incision in the common duct, but in pushing it up it got away from me and passed from the common duct into the foramen of Winslow below the stone. When down, I was in a quandary. After a few moments' deliberation I made an opening in the common duct at the pouch occupied by the stone before, and expected to pass up a small forceps and extract it, but I was unable to do so. The stone eluded the grasp of the forceps, so I stitched in a large drainage-tube.

passing it up through the opening in the common duct."

The instrument consists of forceps with an incomplete ring at the end of each jaw. A piece of small rubber tubing is drawn over each incomplete ring to prevent any tissue between them from being crushed or bruised. If the stone is found in the first portion of the common duct or can be pushed up into the first portion, the lower jaw of the forceps is passed into the foramen of Winslow below the stone. When the jaws are closed the incomplete rings will surround the stone and hold it firmly, and it may be drawn up into the incision (Fig. 5). The duct may be incised and the stone removed. The forceps will still hold the duct up in the incision where it may be sutured, or a drainage-tube or gauze be fastened to it. The rings also keep the bile from escaping, while they hold the duct up in the incision. In this way the bile is held back firmly under control until the operator is ready to release the forceps. The rings closely encircle the stone, so that pressure on the portal vein is more easily avoided. After the drain has been placed the opening in the rings allows the forceps to be removed without disturbing it.

It has been suggested that the forceps make a convenient and safe instrument for grasping and making traction on the intestines or stomach.

DISCUSSION OF THE TWO PRECEDING PAPERS

Dr. D. S. Fairchild (Des Moines, Iowa): I find myself entirely in accord with Dr. MacLaren in relation to leaving the gall-bladder. I wish someone could tell us when to remove the gall-bladder and when not to do so, but I imagine the time will never come when that can be done. It is largely a matter of personal equation with the operator as to whether it should be removed or not. Although I understand some surgeons make it a routine practice to remove the gall-bladder, there are many others who do not do so.

About a month ago I saw Dr. Erdmann of New York

do a gall-bladder operation, and he said at the time that he made it a rule to remove the gall-bladder in all cases. I saw a couple of cases under his care that had been re-operated on on account of the reformation of stones in the common duct. The stones reformed on account of the fact that the bile-tracts had not been drained long enough. In removing the gall-bladder there was a failure to drain the bile-tracts, and for that reason there was some infection in the bile-tracts, and the continuance of this infection led to the reformation of these gall-stones.

As I said at the beginning, my own observation is that the question of removal of the gall-bladder is one to be determined by the operator himself. I have in my own work had a number of cases in which I thought for a time that it would have been better for the patients if their gall-bladders had been removed, as they did not seem to get well, but later I was very glad indeed that I did not remove them, because the patients ultimately recovered.

Dr. B. B. Davis (Omaha, Neb.): There is no question but what some gall-bladders ought to be retained, and some ought to be removed, and if a gall-bladder is going to functionate normally, or even fairly nearly normally, I believe it should be retained.

As to the question raised by Dr. Fairchild with regard to what gall-bladders should be retained and which ones we ought to remove: I am certainly as far away from deciding that question now as I was three or four years ago. I have tried to study these gall-bladders at the time of operation, and determine definitely whether to remove them or not, and occasionally I retain a gall-bladder which afterwards gives trouble and which I wish I had removed. Once in a while I do a secondary operation for the removal of the gall-bladder, which should have been removed at the primary operation. On the other hand, I have seen some very bad gall-bladders functionate afterwards and get along all right, but the reason I did not take them out at the time of the primary operation was because the patients were in such a bad condition that I did not dare do it. The whole question is a very difficult one to decide. I have been working along this line a number of years. I read a paper before the American Medical Association on this subject, at New Orleans, and since that time I have studied the subject very thoroughly and carefully and have arrived at definite conclusions. Every once in a while I am disappointed. There

Fig. 5. A, Rectus muscle. B, Stomach. C, Common duct with stone. D, Duodenum. E, Posterior wall of the sheath of the rectus muscle. F, Anterior wall of the sheath of the rectus muscle. G, Gall-bladder. H, Rectus muscle.

The sone and duct are held up close to the surface with the forceps.

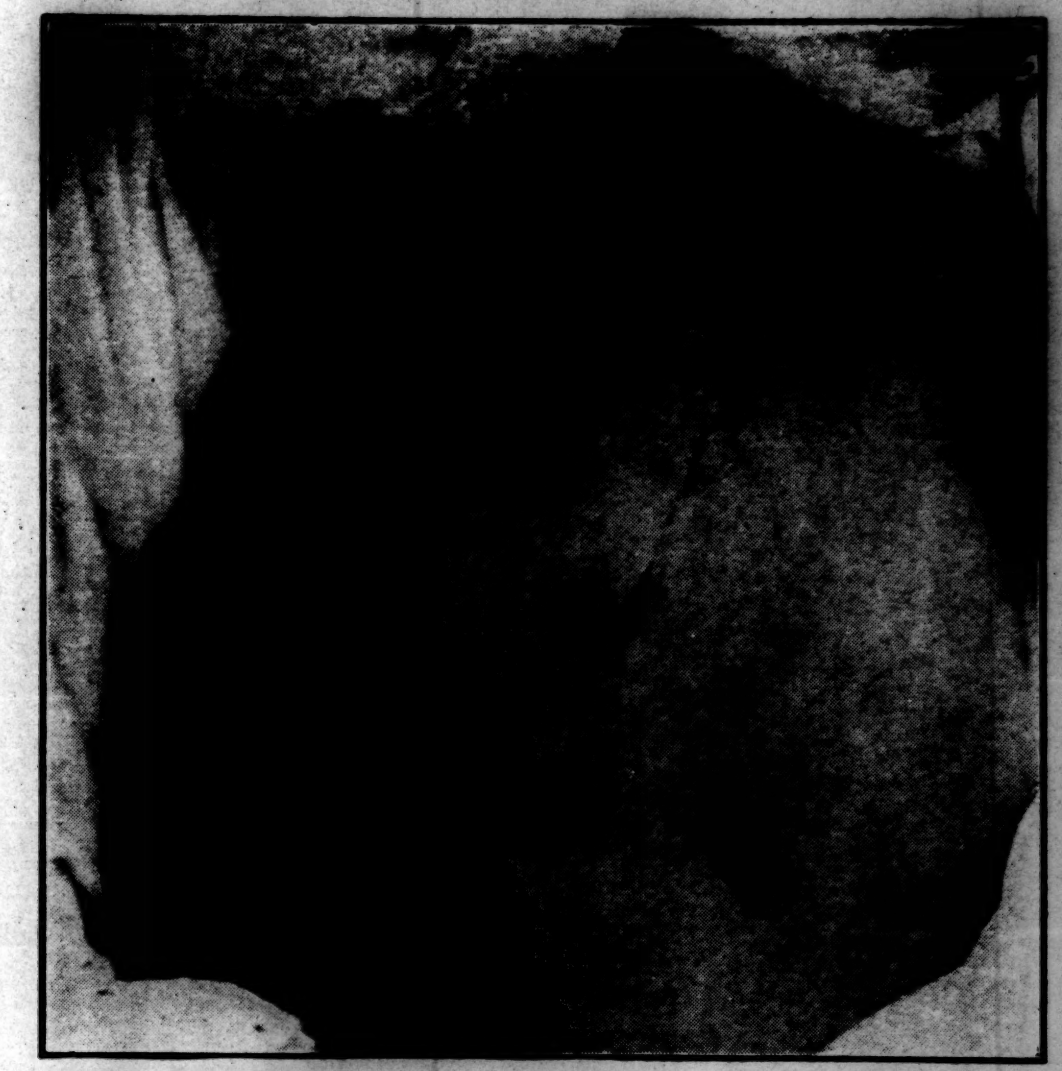

Fig. 6. Photograph of an incision taken twelve days after the operation. A gastro-enterostomy was done, and the gall-bladder drained through this incision.

are certain things where we feel confident that it is a definite and direct indication of cholecystectomy, but I have had this experience within a few months: A patient came back to me with a recurrence of the trouble. She had had before a great deal of pain, and I found on examination in that case, after removing the gall-bladder, there was a very small orifice in the cystic duct, just at the junction of the gall-bladder proper where it narrows down. This was the cause of the trouble. Now, I cannot determine at the time of operation whether that cystic duct is going to narrow down or not. Oftentimes we find a stone or stones impacted well down there, and it is difficult to determine, without removing the gall-bladder and examining it in this way, as to whether the injury to the mucous membrane has been sufficient for constriction to occur or not. This point we shall never decide to our satisfaction entirely. When I find a fibrous-walled gall-bladder, contracted, or a case where there is a stone lying impacted in the cystic duct, I do not hesitate to remove the gall-bladder.

I wish someone could really formulate some good working rules for these cases.

Dr. W. W. Grant (Denver, Colo.): The Chair would respectfully ask the gentlemen who contemplate participating in this discussion, from now on, to consider the pathological condition of the gall-bladder itself and its size in determining the procedure to be employed, whether it be cholecystotomy or cholecystectomy.

Dr. J. W. Andrews (Mankato, Minn.): I wish to make an observation in regard to Dr. Collins' paper, in connection with operations on the gall-bladder. These operations are more or less serious, and, it seems to me, the surgeon should spend as little time as possible in getting into the gall-bladder or into the parts he is going to operate on. If I rightly understand the incision that has been described by Dr. Collins, and explained by him, it requires an unnecessary amount of dissection. The easiest way to get into the gall-bladder is not to separate or divide important structures, and it would seem to me that a wiser thing to do would be, if I understand the anatomy of the parts in that situation, not to divide important structures, and I cannot see that any important structures would be divided by the ordinary incision or incisions used.

Dr. Charles H. Mayo (Rochester, Minn.): These papers

open up an enormous subject, and, as Dr. Fairchild has already said, a good deal depends on the personal equation of the operator. Some years ago a good many surgeons advanced the idea that when they operated on the gall-bladder for gall-stones or cholecystitis, they always took out the gall-bladder. A good many of those individuals are no longer doing this. Now they pick out certain cases in which they think the gall-bladder should be removed. The first paper stated that in none of the cases in which the gall-bladders were removed was it thought they could possibly ever functionate again.

As to the appendix: We all agree that it is not of much use and that it had better be removed anyway when it is diseased. But the gall-bladder, I believe, has a function in furnishing mucus. The power of the gall-bladder to form mucus is greater than that of the liver to form bile. We find there are certain animals that have no gall-bladder, such as the deer, but they have larger liver ducts, and they have larger common ducts in proportion to the pig, so that the pig has a good-sized gall-bladder, although of the same body-weight and size as the deer which has none, so that it is possible that the ducts themselves in being larger in some way change this bile before it passes into the intestine, because it has been shown that when bile is withdrawn from the hepatic duct and injected into the pancreatic duct, it sets up inflammation, while bile, after it has received mucus and is withdrawn from the gall-bladder and injected into the pancreatic duct, does not cause anywhere nearly as much inflammation as it does when it is withdrawn from the hepatic duct itself. So when we decide as to the question of the removal of the gall-bladder we must first consider the rate of mortality. The mortality-rate now, involves about ⅓ of 1 per cent more risk to remove the gall-bladder than to drain it. At the same time, in some 2,700 operations on the gall-bladder and ducts we have had but two cases in which stones have reformed in the gall-bladder. In five cases we have had stones reform in the common duct, and in three of those the gall-bladder has been removed; and I believe, when the gall-bladder is removed the ducts become larger and dilated and take on that condition we find in animals that do not have any gall-bladder; so that if we have a tendency in an individual not to clean his bile, then there is a possibility of the reformation of stones in the common duct. Some surgeons say, if you are in doubt as to whether the gall-bladder

should be removed or not, it is better to take it out, because, if it is not removed, you may have to operate again. The man who has operated only on one or two cases, and has not removed the gall-bladder, is apt to take that position if stones have subsequently developed in the common duct. But those of us with more experience would rather remove ten or fifteen gall-bladders secondarily, where the gall-bladder has been left at the primary operation, than to do one common-duct operation after the gall-bladder has been removed.

In reaching a decision we have to consider cholecystitis. A case of cholecystitis that will maintain a chronic inflammation of the gall-bladder mucosa, with its changes which are so easy to identify without the presence of stones, is one that is rarely drained long enough, and then comes the question of its removal. If we drain in a case of cholecystitis, and a relapse occurs, for a considerable period the case should be put in the line of those for medical treatment. These are the cases that would do well at Carlsbad. Under watchful care, regulation of the diet, and the administration of large doses of urotropin, one can purify the bile and do these individuals good. There is usually no stone present in these cases. It is a cholecystitis, and possibly we must go farther than the gall-bladder, clear to the liver, to purify the bile. When we operate on the gall-bladder, bad as it may look, many a time the patient will recover. Drainage is safe and simple, and a secondary operation on the gall-bladder is not serious.

Dr. Archibald MacLaren (St. Paul, Minn.): I did not read all of my paper. I strayed away from the text, and did not cover one or two points.

In regard to stab-wound drainage: My mortality-rate in general gall-bladder surgery has been greater than it should be because I have used stab-wound drainage of the gall-bladder too frequently. I want to make the point that, when doing a laparotomy for a large abdominal tumor, a stab-wound for the removal of gall-stones is quite a dangerous procedure.

In a sequence of twenty cases of hysterectomy, there were three deaths, while the mortality-rate of hysterectomy, uncomplicated, was 2 per cent. The reason why stab-wound drainage is more dangerous is that we cannot protect the gall-bladder entirely from leakage, so that my present conclusion is that it is only under exceptional circumstances that I would remove gall-stones, by this method, in the presence of a large pelvic tumor. Where, with a tumor in the pelvis,

it is discovered that the patient has gall-stones, in my judgment it would only be exceptional that we should try to remove them at that time; we ought rather to put it off and make a second operation, or make a separate, distinct opening that you can wall off. It is poor surgical judgment to try to make two operations with a gauze tamponade and drain the gall-bladder under direct observation with practically one opening. I have done this many times in the past, but I think it ought to be done only under exceptional circumstances.

DR. COLLINS (closing the discussion): The evolution of the abdominal incision has been of considerable interest to me. In the early days of abdominal surgery an incision was made to give access to the pathological lesion involved. We had the old Somenberg incision for abscess made through the structures of the right lower abdomen, and no effort was made to make it parallel with the fibers of the external oblique. They were frequently cut obliquely across, and the internal oblique and transversalis muscles were cut across. Many patients had hernias following that incision. The first step was made in advance when it was considered advisable not to cut across the muscular fibers, but to split them, and we began then the McBurney incision which came into vogue for appendicitis and the removal of the appendix. That incision is used now mostly for the removal of the appendix. For the lower abdomen the Pfannenstiel incision was advised, with a tendency not to make the incision continuous down through the different layers, but to have the aponeurotic and muscular openings run in different directions. Then came the question of the intercostal nerves. It was thought the bulging which followed some operations, was due to weakness of the abdominal wall, caused by trophic changes or paralysis of the muscle because of cutting across the intercostal nerves. Now we are conserving these nerves as far as possible. It is as an effort in that direction that the incision I have described, is advised. It is a good thing not to injure structures any more than can be helped. This incision does not injure the intercostal nerves or muscular structures. It does not take long to make the incision and remove the stone or stones. A stone can be removed from the common duct in twenty minutes from the time the incision is begun until it is closed. I have done it in that time in many cases.

MEMBRANOUS PERICOLITIS

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The terms *pericolitis* and *perityphlitis* were found rather frequently in the literature beyond a quarter of a century ago. They were applied practically to all forms of peritonitis which happened to localize about the cecum and colon, regardless of the original source of the infection or the character of the peritonitis found present; in fact, the pathology, which antedates the dead-house, was so little known that practically all peritonitis of the right side of the abdomen was traced to the cecum or to the colon as the essential starting-place. With the discovery that, in the vast majority of these cases, the appendix was the real original offender, our ideas and methods were so radically changed that the old terms pericolitis and perityphlitis practically entirely disappeared from literature. We now usually speak of these pathological conditions either under the name of the original local lesion, as appendicitis when such origin can be determined, or as localized peritonitis of varying type when the initial lesion cannot be determined. Practically, therefore, all these peritoneal lesions of the right side of the abdomen are looked upon as either the immediate effects or the remote result of some *acute* present or antecedent inflammation, generally originating in the appendix; consequently whenever

we find any late manifestations of peritoneal disturbance about the colon we have been content to label it "adhesions," presume an antecedent acute appendicitis, and pass on. Some very striking and not infrequently repeated observations occurring to the writer now over a period of nearly seven years have persuaded him that there is a most interesting pathological condition occurring about the right colon which cannot thus readily be set aside. This condition presents a rather striking pathological picture of its own. The composite observations of quite a fair number of personal cases have convinced us likewise that this condition has a most pronounced clinical picture of its own; and, further, we are of the opinion that for this condition some special surgical treatment must be devised. To this end we have applied certain new methods in seven cases, which we shall present for what they are worth.

At the outset, we wish to disclaim any notion of having discovered or invented any new disease. We are sure that this condition has been observed possibly frequently by every surgeon of experience. Thus far, however, we do not think it has been either properly described from the pathological side or recognized as a clinical entity, neither has it received any special surgical consideration. As a possible incentive to further studies this paper is presented, as an observation and not as an argument.

Pathological Description.—The following description of this condition is presented from the report of Dr. Frank Hall, Pathologist to the Kansas City General Hospital, from a specimen found in a post-mortem subject:

The specimen of ascending colon which you have presented to me as a type of the pericolitis you have been interested in, exhibits the following gross and microscopic features: The specimen presents the caput coil with attached appendix,

the ascending colon, and a short segment of the transverse colon.

From a point just at the hepatic flexure to three inches above the caput there spreads from the parietal margin over the external lateral margin to the internal longitudinal muscle band a thin vascular veil in which long, straight, unbranching blood-vessels course, most of which are parallel with each other and take a slightly spiral direction over the colon from the outer upper peritoneal attachment to the inner lower portion of the gut ending just above the caput. The appendix is not implicated in any way.

Coursing with the blood-vessels are numbers of shining narrow bands of connective tissue which gradually broaden as they go and end in a slight fan-shaped attachment at various points on the anterior and inner surface of the colon. At these points of attachment the gut is held in rigid plication.

The entire specimen conveys to the eye the idea that an edematous fluid lies beneath this delicate membrane and reminds one of nothing so much as an edematous arachnoid, so often encountered on removing the dura mater from the brain of a dead alcoholic. The colon seems placed in a diaphenous bag slightly too short to contain it without wrinkling. At the beginning of the hepatic flexure the drawn membrane particularly angulates the contained colon. Here and there are spots and tags of fat beneath the cobweb. On handling the specimen the colon slips about in its bag without entire freedom as a fetus within its amniotic sac. A portion of the parietal peritoneum has been removed with the colon and shows that the membrane and blood-vessels arise in, and are continuous with, the structures of the parietal peritoneum, as it sweeps over the colon. The entire structure seems to be peritoneum, loosed from its close connection to the abdominal wall and colonic surface by some serous exudate after which the particular vascularization and connective-tissue banding has occurred as a chronic reaction to irritative influence.

Miscroscopic sections prepared from blocks of tissue cut entirely through to the lumen of the colon present, first, a very loose external covering, a normal musculature, a broad submucosa, and a normal glandular coat. Our chief interest lies in the serous coat, which is seen to have its fibers split asunder as if by a serous infiltrate thus lifting the endothelial layer of the membrane, which is clearly demonstrated to exist as a covering over all. The blood-vessels present in cross section and are unusually large and thin-walled. Wherever

a blood-vessel courses there also is a condensation of the white fibers into bands parallel to the vessel. The general aspect of the region under discussion is that of a mass of more or less isolated fascicles of white fibrous tissue with here and there a blood-vessel filled with blood, broad clefts lined with endothelium, and a few fat and connective-tissue cells sprinkled here and there.

No fibrin, polymorphonuclear leucocytes, or other evidence of inflammation are present. The connective tissue next to the layer of longitudinal muscular coat is condensed and seems to penetrate in increased amount between the muscle bundles. Aside from this questionable matter, the gut and its walls are normal. The endothelial covering in places on the surface is perfectly preserved and demonstrates beyond a doubt that we have here no new or false membrane but simply a rarefied and otherwise altered natural structure. The enlargement of the endothelial-lined clefts, so abundantly observed, suggest a chronic lymphstasis as an associate condition, which is possibly a key to the formation of the amount of fluid in the tissue spaces of the peritoneum.

In addition to this description we would add some observations of the condition as observed in quite a number of living subjects seen in the course of surgical operations. The transparent, vascularized veil-appearance of the membrane strikes one's attention very forcibly, with the parallel bright red vessels running with the long axis of the ascending colon. In some instances it appears as though the membrane comes on to the colon from the lateral parietal wall just above the cecum and courses directly upward to disappear beneath the liver on the superior layer of the transverse mesocolon. In other instances it seems attached like an adhesion to the under surface of the liver, well anterior to the normal peritoneal reflection. Again, in other cases it appears as though it had begun above and descended on the colon to its termination, usually just above the cecum. We have also seen it pass across and upward to the transverse colon, which, in one instance, was apparently drawn down by the membrane, practically paralleling the ascend-

ing colon to the level of the cecum. In this case the gastric symptoms were marked as a result of the mechanical gastroptosis thus produced. In one instance this membrane was so dense as to lose entirely its apparent vascularity and transparency, and it looked like a solid sheet of organized fibrous tissue, beneath which the ascending colon was so lost that it could not be seen at all until the membrane was divided and brushed aside when an apparently normal, though contracted, colon became evident.

In no instance does this membrane resemble our ordinary conception of an adhesion. It is never adherent to the abdominal wall nor to any contiguous loops of small intestine. Instead, it resembles more closely than anything we can describe, a thin pterygium. In recent cases the membrane is quite free and produces but limited restriction to the underlying colon. In more advanced and characteristic cases it seems to bind the colon close to the posterior abdominal wall and produces such marked angulations and convolutions of the colon as to practically produce a stricture of its lumen; in fact, in one case seen in autopsy when a stream of water was caused to flow into the cecum through the ileocecal valve, the cecum distended almost to bursting, and yet none of the fluid would pass through the ascending colon and past the hepatic flexure until it was milked through with the fingers. It is also noteworthy that in the large majority of cases the cecum was not involved in the membrane at all; nor was the appendix invested, except when it occupied an ascending position at the outside of the colon, and then it was covered by the membrane as it was reflected on to the colon from the lateral parietal wall. The appendix in almost every case, however, was rather small and sclerotic. We have seen the membrane in one case in which there had been, years before, an appendicular abscess, which was drained.

In this case the cecum was likewise markedly involved in the membrane. The angulation of the colon is generally most marked at the hepatic flexure. There is always a very loose space where the membrane can be easily picked up at the outer angle, where it passes from the colon to the outer parietal wall.

Clinical Symptoms.—As we also observed in our introductory remarks, this interesting pathological condition is attended by an equally interesting and rather distinct clinical cyndrone. Our attention was first attracted to this condition in the course of an abdominal operation some six or seven years ago. A brief résumé of the history of this case may be of interest.

The patient had first come under our observation some three years or more before the time of our operating upon her. She was then a probationary nurse in the University Hospital, and I was asked to see her with a supposed attack of appendicitis. She gave the history of a number of previous attacks. In each she had suffered from pain and distress over her entire right abdomen, though more particularly referred by her to the site of the appendix. In none of these attacks had she had temperature or disturbance of the pulse; in fact, none of the characteristics of an acute appendictis or peritonitis. She had frequently gone to bed, however, for a day just from pain and discomfort. She said that she had never felt entirely comfortable in her right side for years, but did reasonably well except when these severer "spells" came on. She was a very attractive young woman in her personality and quite intelligent, though of a decidedly high-strung temperament and somewhat neurotic. She described her symptoms very freely; in fact, she was more fluent than the average female is in portraying her complaints.

We found her with a normal pulse and temperature. On palpation she complained of tenderness all over the

right abdomen and was indeed quite hyperesthetic. There was no rectus rigidity. She located her greatest tenderness about the appendicular region in general, but we could not focalize to a finger-point. We fell in quite readily, however, with a diagnosis of chronic recurrent appendicitis and recommended operation upon her recovery from this "spell." There was no suggestion of urgency. When she got up, still being a probationer, the superintendent of nurses decided not to accept her in training, as she considered her too neurotic to make a satisfactory nurse. She therefore left the hospital, and we did not see her again for three or four years. She then came again to Kansas City from her home in Iowa, where she had married and then lived, especially to consult us again. We then learned that in the interval she had been operated upon by a distinguished surgeon whom we knew, and had her appendix removed. She obtained no relief from the operation and continued to suffer as before. A second operation was done, and one of her ovaries was removed. There was still no relief, and with this history she returned to us. On examination, with the appendix and one ovary gone, we could find no explanation for her continued symptoms. She was therefore referred to one of our leading internists, who sent her back again, saying that the other ovary was diseased and should be removed. We could not confirm this diagnosis ourselves, but she insisted upon relief, and we consented to operate upon the diagnosis of our medical confrere. Operation disclosed the one remaining ovary perfectly healthy. A perfectly healthy broad ligament was found on the side from which the ovary had been removed. We then decided to inspect the site of the appendix. Here was found a perfectly smooth cecum at the site where the appendix had been with not the slightest adhesion of any kind. Above the appendix, indeed really above the cecum

about the colon, my attention was strikingly attracted to the condition with which this paper is concerned. Here I observed what looked like an entirely complete new layer of peritoneum, perfectly transparent, investing the colon from the cecum to the hepatic flexure. This membrane was very loosely attached, but moved freely over what appeared to be the normal peritoneal coat of the colon beneath. This membrane was also made striking by a large number of what appeared to be small capillaries, bright-red in color, running as parallel pink threads in the direction of the long axis of the colon. These capillaries appeared to run in similarly parallel delicate strands of fibrous tissue. The whole tissue resembled very much a veil which moved rather freely over the face of the colon beneath. This membrane appeared to come on to the colon from the outer parietal wall, into which it quietly faded away and above the hepatic flexure of the colon became lost in the transverse mesocolon. The membrane covered also the whole of the circumference of the colon and imperceptibly became lost in the inner side of the colon and the inner parietal peritoneum. The whole right colon was rather closely confined in the lumbar fossa and could not readily be pulled forward. Likewise it seemed distinctly shortened in its long axis, and at places it presented a pleating with the delicate fibrous strands of the investing membrane, passing straight across from one fold to the other. It thus appeared as though the colon was restricted both as to the action of its circular and its longitudinal fibers and more or less immobilized to the posterior abdominal wall. There were no adhesions between the colon and any contiguous structure, and the membrane did not strike us as analogous to an adhesion in any sense. It looked, instead, as we have described, as a new adventitious, vascularized, investing layer of peritoneum. At the

time of our first observation it impressed us as some sort of an anatomical freak which we in no way associated in our mind with the woman's complaints. We made no attempt therefore to deal with the membrane in any way, and with the simple observation of its peculiar appearance closed the abdomen. The patient was of course not improved in the least by our operation, though we were satisfied now with a diagnosis of neurasthenia and placed her malady in her head and not in her abdomen.

In the course of years, both before and since this case, we can recall several cases of a somewhat similar clinical picture in which we have operated with a diagnosis of chronic appendicitis and removed the appendix, but without the expected relief to our patient. These cases being always considered uncomplicated chronic appendicitis, were operated on with a very small abdominal incision and the colon was not seen at all. The real condition in these cases is as yet conjectural as we have had no opportunity to re-operate in any of them. In the light of other demonstrated cases, however, we now have a strong suspicion that this same pericolonic membrane could be found in at least several of them.

Following this interesting case, we have operated in several cases of somewhat similar type, and with the diffused symptoms have been in doubt as to whether the trouble lay in the appendix or in the gall-bladder. In several such cases, in order to expose both sites through one opening, we have made a free right rectus incision midway, which could be enlarged in either direction, as found necessary. This incision thoroughly exposes the ascending colon. In several of these operations we have found both appendix and gall-bladder perfectly normal, but to our surprise and interest have again observed this same peculiar pericolonic membrane.

In retrospective study of these several cases in which this membrane was found, and by a species of composite photography, we are gradually greatly impressed with certain striking similarities in the clinical histories of each of these cases scattered through years. These observations we have remarked to several of our surgical colleagues through the past few years, and becoming themselves interested in the subject they have been able also to confirm both the pathological picture presented and its clinical characteristics. Finally, from these repeated personal observations and with the corroborative evidence of these colleagues, we became convinced that this interesting condition was susceptible of differential diagnosis. With this opinion we have, since May, 1908, made this positive diagnosis in five cases, in each of which the diagnosis was proven by operation.

The pathological condition has also been observed in several other cases where the diagnosis was not made, but could have been I am sure with a closer attention. In one of these there was a positive change in the appendix, which was as large as my thumb and thickened clear onto the cecum. The appendicular symptoms so overwhelmed the lesser evidences of the pericolonic membrane that it was not suspected, though further inquiry after operation disclosed their added symptomatology. In yet another case the membrane was observed incidentally in a patient operated upon for cyst of the broad ligament. This patient's history showed a previous acute appendicitis with abscess, which was drained without removal of the appendix. In this case there were no visceral adhesions at all; the appendix with its mesentery was free but small and sclerotic; and in this (the only case in which such has been observed) the membrane surrounded the whole cecum.

In still two other cases a positive diagnosis was not

made between this condition and ordinary chronic appendicitis; but in each of these cases the suspicion was sufficiently strong that we made a rather larger incision than we are accustomed to make for simple appendectomy, in order that we might inspect the colon. In these two cases the membrane was much more delicate than in the other cases observed; there were but few of the fibrous-tissue strands with consequent slight impairment of the mechanics of the colon; they were both of short clinical duration; and the picture was accordingly not clear.

In all, therefore, we have observed the membrane in nine cases operated upon within one year.

That we may gain a clearer conception of the clinical symptoms in this condition we shall here take the liberty of introducing the clinical histories of four of the first cases in which we operated with a definite diagnosis in advance. To avoid the prejudice of personal impressions each of these histories has been written by others than ourselves.

Case 1.—(This history is written by Dr. C. C. Conover, Lecturer on Principles and Practice of Medicine in the University Medical College of Kansas City by whom the case was referred.) Mabel N., aged 28, single, twin, from a more or less neurotic family. Father living, not a very strong man, but in good health. Mother died from operation for gall-stones. Patient was in good health, with the exception of constipation, until twenty years of age. Eight years ago she suffered an acute attack of abdominal pain, the seat of pain being two inches to the left and one inch from the umbilicus; no vomiting, constipation continued. About one year later the patient suffered from a summer attack with pain in the same location as before. At this time two ounces of castor oil relieved all symptoms, and she was soon in apparently good health again. Preceding this attack she was very constipated, as before. From this time on, six to nine months apart, for the most of six years these attacks were repeated and always under similar conditions, with the pain in the same location, no vomiting, and constipation continued. Attacks always relieved by cathartics. Two and a-half years

ago, along with the attacks which continued as before, stomach symptoms were added somewhat in this order: constipation (hard to relieve), nausea and loss of appetite, flatulency, hyperacidity, severe pain in the same location, and vomiting of sour smelling stuff. Morphine, oil enemata, and rest in bed two days. This was followed by fairly good health. During the time, 1906 to 1907, the patient lost in weight from 98 pounds, which was her normal, to 78. At the beginning of 1908 constipation continuing, the patient, with other added symptoms, began to pass large quantities of mucus, and the attacks came closer together. Between attacks the abdomen was sore to the touch, even to the clothing. Stomach very sour; headaches; poor appetite; general ill-health; weight in May, 1908, 72 pounds. During March, April, and May, 1908, alternate constipation and diarrhea, at intervals passing mucus, no pain preceding the passing of the mucus, no casts of the bowel on examination. On physical examination, tender all over right abdomen and epigastrium; gas-distention, particularly over the right side and the cecum. Stomach distended and full of gas.

Case 2.—(This case occurred in the practice of our colleague, Dr. George B. Norberg, Professor of Gynecology in the University Medical College, to whom we are indebted for this report.) Mr. T. F. W., aged 45; height, 5-11; weight, 148; occupation, farmer; residence, Missouri. Consulted me on May 16, 1908, giving the following history: Has been ailing about fourteen to sixteen years. To his best recollection the first attack started like a "summer complaint," followed by a diarrhea more or less severe, for four or five years. During this time there has been much loss of flesh; appetite poor; he is extremely nervous and weak; he has been told that he had stomach and intestinal fermentation; there is much bloating after taking food, with a gradual onset of pain, which reaches its height in about two hours and then begins to subside. Sometimes he becomes suddenly nauseated, but has never vomited to his recollection. The mouth and throat feels dry, and he is stupid and sluggish.

His whole abdomen is tender and sore, as if it had been bruised by external violence; the tenderness is especially great just to the right of the umbilicus. Pain is less when the bowels move frequently, and usually is relieved by taking a cathartic. During all this time he has been taking treatment from reputable physicians and several charlatans, the latter always promising a cure.

Recently his diarrhea has been of the mucous variety.

Very severe pain immediately after eating or drinking; depressed mentally and wants to die, if he cannot be cured.

Diagnosis: Chronic appendicitis.

Operation, May 18, 1908, at the University Hospital.

Incision in the usual location and of the usual length for an operation. The appendix could not be felt with the finger, neither could the cecum be outlined. Incision was enlarged to considerable dimensions, when the cecum and the lower end of the colon (about six inches) were found to be entirely covered and bound down by a thin membrane (pseudoperitoneum). This was ligated in sections with fine pyoktannin catgut and cut and stripped down until the bowel was freed and could be raised out through the abdominal opening. The appendix was long, kinked, and hard, but did not show signs of recent inflammation.

This patient made a most speedy and perfect recovery. He left the hospital for his home on the twelfth day. He could eat and drink without pain, and was extremely happy. His depressed mental condition seemed to take a sudden flight. He often remarked that "for years he would go to bed hoping he would go to sleep and never awake."

On Sept. 14, 1908, the first time I had seen him since the operation, he visited me in my office, and gave the following report:

About three weeks after operation he was riding horseback (his horse trotting and pacing) when he felt a pain in the upper part of the abdomen. This became quite severe after he reached home and lasted three days. He was relieved by taking a cathartic and has not felt pain since. He eats heartily, and does farm-work, which he has not been able to do for years. He weighs 168 pounds, is strong, perfectly well, and extremely happy.

On Nov. 25, 1908, the patient called at my office. He has been perfectly free from pain; appetite, good; bowels, normal; sleeps well and is extremely happy over his condition.

Case 3.—(This case was referred to us by her physician,

Dr. Davies of Emporia, Kansas, and the appended history was furnished by her husband.)

Your letter received and in accordance with your request, I herewith hand you statement of Mrs. R.'s condition and symptoms prior to your operation for the period covering the last four years.

The first trouble noticed in connection with the bowels occurred in March, 1904, when she was confined to her bed for six weeks with an attack of catarrh of the bowels. This illness took place shortly before we were married. We were married in May, and shortly afterward she became pregnant. During the time of her pregnancy she had little or no trouble with the stomach or bowels.

Our baby was born in February, 1905. From that time on until May 30, 1908, she was troubled more or less with severe pains in her stomach and right side, the trouble being more pronounced the week following her period of menstruation. There was much gas formed in the stomach, which caused her to bloat so that at times it was impossible for her to fasten her clothes around her in the proper manner.

On May 30, 1908, she was taken with severe cramps in the stomach and bowels, accompanied by gas. Her bowels moved very irregularly, the stools having a porous formation and a putty color, and were full of mucus. She would crave food and upon eating would have severe cramping of the stomach, followed by a movement of the bowels. One afternoon during the second week in July she had a severe attack of cramps which lasted three hours, the bowels moving ten or fifteen times, accompanied by severe vomiting. From this time on every particle of food taken into the stomach would distress her, especially any kind of fruit or vegetable. There was a great amount of gas on the stomach, which caused much belching.

About the middle of August her mouth became filled with a great many canker sores. She consulted a physician, who prescribed washing of the stomach. This was done every morning for almost a month, without any beneficial results. From this time she ate nothing but poached eggs and cereals, also toast. Even these caused the stomach much distress for two hours or more after eating. The last week in September she was barely able to be out of bed and ate almost nothing. She tried malt, but with distressing results to the stomach. During all of this time she was extremely nervous. For a day or two at a time she would be fairly well, then for several days would be very bad.

Upon the morning of October 7th, about 9 o'clock, she had an attack with her heart which continued to get worse until about 1:30 P. M., when vomiting set in. At 2:30 she had a very severe vomiting spell, after which her limbs became cold and numb, accompanied by blindness, and she was unable to see anything for about twenty minutes. She had absolutely no control over any of her muscles during this time. The attending physician gave medicine every five minutes, and it took the combined efforts of three people rubbing her with alcohol for forty minutes to restore circulation. The physician said her heart-action was over two hundred a minute, and that the blood left the extremities and became centralized in the head and heart and stomach. She rallied from this attack and was taken to the hospital for an operation on October 12th. I believe this covers the case to the best of my knowledge.

CASE 4.—(The history of this case was taken by my assistant, Dr. James P. Henderson.) Mrs. H., aged 29; residence, Kansas City, Kansas. Father living and in very good health. Mother died at the age of 30; cause of death, childbirth. Three brothers living, all in good health, and none dead. No sisters.

This patient had most all of the common diseases of childhood, such as measles, and whooping-cough, etc.

Her first menses began at the age of thirteen. She complained of a great deal of trouble (pain). This period lasted a week and was regular, so far as she remembers. These periods were regular until the birth of the first child. During all this time she complained of pains, and was more or less nervous. She has been married for ten years. She has had two miscariages. The first one did not give her very much trouble, but she felt weak and had pain in the lower abdomen. The last miscarriage gave her a great deal of trouble, and the after-birth had to be removed with instruments. She remained in bed about twelve days during this time. She had a great deal of pain in the abdomen, and felt very weak and extremely nervous. Since this last trouble she has had no irregularity of the monthly periods.

Present History: She first noticed this trouble nine months ago, or in March, 1908. She suffered a great deal with severe frontal headaches which radiated over the forehead and to the temple region, and at times she complained of occipital headaches. This occipital headache was continuous and even got worse in time. At the same time she complained of pain all over the abdomen, more especially deep

in the right side; this pain was cutting in character and, as she said, "like sticking or cutting of a knife." She called these "kind of spells." At the same time she had griping pains all over the abdomen. Both the pain and the griping seem to get worse, more especially when on her feet for any length of time and climbing stairs. There was backache across the small of the back; there was pain here most of the time. This pain seemed to get worse at her monthly periods. The pain in her side would also get worse when she was lying on the right side, or when on the back and then quickly turning over to either side or starting to get up suddenly. About the middle of May she noticed that she would increase in size at the waist, and there was some bloating and belching of gas and passing of gas by the bowels. At this time she said she was very nervous indeed. She could not sleep very well, and she could not find anything to eat that seemed to agree with her.

About three months before operation and especially at her monthly periods, the pain, bloating, headache, and backache would get worse, and after meals and in the morning early and very late at night she would complain of feeling full. After eating there was a pain in the upper part of the abdomen that felt like a coal of fire to her. She was always constipated; no history of diarrhea until about four months before operation. Yet she thinks that she passed mucus by bowel. There is no history of any blood being passed by bowel. She complained of a great deal of bladder trouble, such as frequent urination and a great deal of burning.

Diagnosis: Laceration of the perineum; endometritis; membranous pericolitis.

Operation: First, perineorrhaphy; dilatation of the cervix; curettement; appendectomy; plastic excision of pericolic membrane.

From these clinical histories, which were duplicated in essential details in all other cases, we formulate the following clinical syndrome.

1. *Pain.*—In every case pain of some sort has been the dominant symptom which has led the case to be referred to a surgeon. Sometimes this pain is quite severe; sometimes no more than distinct distress. This pain or distress usually has a fixed time of origin and is progressive in its development, though often

in the early stages with remissions of comparative comfort for variable periods. Later, the pain or discomfort is practically constant, though marked by periods of acute exacerbations, often requiring morphine for relief. This pain is referred pretty generally to the whole right side of the abdomen and can not well be localized to a particular spot.

2. *Tenderness.*—This tenderness amounts as a rule to a hyperesthesia and often is such as to render the pressure of clothing quite unbearable. Like the pain, it is diffused pretty well over the right side of the abdomen, though frequently more marked at McBurney's point and just below the ribs. These particular points generally lead the practitioner to refer the cases to a surgeon with the diagnosis either of appendicitis or gall-stones. The rather distinct localizing symptoms of the latter condition are, however, lacking.

3. *Constipation.*—Constipation is always marked, particularly in advanced cases, and large doses of any cathartic are required to secure evacuation of the bowels. The thorough emptying of the gut, however, usually affords distinct but transitory relief.

4. *Mucous.*—Mucous discharges from the bowels occur rather frequently, particularly in advanced cases. This symptom, however, is not always elicited, except on direct inquiry, but then it is usually obtained.

5. *Gas.*—Gaseous distension is marked, particularly in the exacerbations. It is most marked over the cecum, which is often greatly distended. The patients particularly notice this bloating, as they designate it, which often makes the constriction of clothing particularly distressing.

6. *Loss of Weight and Tone.*—As the symptoms progress the patient loses flesh quite perceptibly. With this loss of weight is a similar loss of tone. The pa-

tient becomes weak, the facial expression shows depression and often distress, the color becomes sallow, and the general picture of intestinal auto-intoxication is complete.

7. *Gastric Symptoms.*—Frequently fermentative stomach symptoms are added and are not relieved by any dietary plans or the use of digestive aids.

8. *Neurasthenia.*—Finally the patients become markedly neurasthenic, often almost melancholic. All symptoms are exaggerated, and it would take volumes to record their chronology of complaints.

Treatment.—The use of cathartics and enemata give some transient relief in these cases, but no permanent improvement. Attention to diet and efforts to minimize intestinal fermentation are also of benefit, but are not curative. The removal of the appendix and the drainage of the gall-bladder have been operative resources employed through mistaken diagnosis, but without any relief to the patient. Many have, therefore, after prolonged treatment and often operation, been passed up as simple neurasthenics and condemned to continued suffering without any relief to the patient. To attempt to find something which might be of some benefit to these distressing sufferers has been our effort in these nine cases, which we have observed within the past year.

Synchronously with our recognition of the distinct pathology and clinical identity of this condition, we were impressed with the view that this pericolonic membrane by its mechanical interference with colonic peristalsis was possibly, if not probably, responsible for the chain of symptoms which were manifest when it was found present. Under this theory the pains are readily explained by the traction transmitted to the sensitive parietal peritoneum when gas or feces attempt to pass through this anchored area. The

gaseous distention and flatulency are likewise easily explained by the impediment to their passage through a restricted lumen. Constipation becomes evidently necessary where the peristalsis is so markedly interfered with by the contracted fibrous-tissue strands of the membrane, with the increased element of resistance from convolutions, angulations, and kinks, which almost obliterate the lumen entirely. The mucus discharges from the bowel are equally susceptible of explanation, and with all the conditions of intestinal toxemia added the patient should become neurasthenic.

At the same time with the observation of the mechanical elements of this membrane we were also impressed with its apparently distinctly detachable nature and had formed the opinion that with little difficulty it could be entirely dissected off the colon and removed. We were also impressed with the fact that beneath this membrane the colon had a separate normal peritoneum of its own, or a membrane so similar in its characteristics that it would perform a similar function and thus not invite other possibly worse adhesions after the membrane was removed. On these assumptions we have in these cases of the past year proceeded with the following technic:

Operation.—The right colon is exposed by an incision near the outer border of the right rectus muscle from McBurney's point upward to the costal margin. The colon is drawn toward the midline and the membrane exposed where it is reflected to the parietal wall. Here it is divided, usually after clamping along the parietal line and subsequently ligating. The cleavage established with gauze the entire membrane is readily stripped toward the midline upward and downward. As it reaches its point of colonic fixation it tears loose readily and can be removed in a sheet as large as one's hand. At a few points of its at-

tachment to the colon there will be a little oozing of blood, requiring clamps and ligatures in a few points, but most vessels spontaneously cease bleeding. Clamps and ligatures are used where deemed advisable. When the membrane has been cleared off the colon becomes freely movable, and its length is apparently almost doubled. Angulations now disappear. The outer layer of the gut now looks much like a normal peritoneum with a few oozing spots and some shreds of loose connective tissue with little islets of fat. After all constricting membrane is detached and the oozing points controlled, we wash with hot normal salt solution, return to the abdomen, and close as usual.

Results.—This surgical idea has been carried out in seven of the nine cases observed in the last year. One of the remaining two cases was strikingly different from all the others, and a different surgical procedure was deemed expedient. In this case the membrane, instead of being like a transparent, vascularized veil, was thick like a sheet of paper and perfectly opaque. In fact, when we first looked into the abdomen in this case we could not see the ascending colon at all until this thick membrane was split and bluntly dissected off with gauze dissection when the apparently normal-looking, though atrophic and contracted, colon was found beneath. In this case the entire ascending colon was excised with the hepatic flexure, and the ileum was anastomized with the transverse colon.

The other case in which the membrane was not removed was in a patient operated upon primarily for cyst of the broad ligament, which we deemed enough surgery for one frail woman.

The results of these operations may be epitomized as follows:

The first case, whose detailed history will be found above (Case 1) was operated upon on May 8, 1908,

and at the present time is entirely well, the patient weighing 102 pounds, six pounds more than she ever did. She has since married and attends to all her household duties.

The second case (Case 2), a patient of one of my surgical friends, Dr. George B. Norberg, upon which I made a diagnosis and suggested the surgical procedure above outlined, was operated upon by Dr. Norberg on May 18, 1908. This patient reported to Dr. Norberg, November 25, 1908, as entirely cured.

The third case (Case 3) was operated upon on October 12, 1908. When I last heard from her directly (about February 1, 1909) she was considerably improved, but she still suffered some pain and was yet rather constipated. On May 8, 1909, I saw her physician, Dr. Davies of Emporia, Kansas, who reported that he had discovered some suspicous symptoms of specific disease and had had her for several months upon the iodides, and that she has since improved greatly and is apparently practically well.

The fourth case (Case 4) was operated upon in November, 1908. Her recovery was rendered uncertain from the fact that less than two weeks after leaving the hospital her child was taken sick with typhoid fever, and she personally nursed it through this tedious and trying illness. I saw her in March, 1909, when she expressed herself as finally, with some rest and care of herself, as improving rapidly and practically well.

The fifth case was the one with the definite appendicular trouble, and she seemed immediately relieved, but I have not heard from her since leaving the hospital.

The sixth and seventh cases were early cases but have been entirely cured.

The eighth case, while not properly belonging to the experimental operation suggested, was the case

in which the ascending colon was excised. This case has also been entirely cured.

In summary of the operation, we would remark that our report is intended as an observation and not as an argument. The results thus far have been extremely gratifying and encouraging. Whether these results remain permanent is yet to be seen, as the lapse of one year or less is not sufficient to prove the merit of a procedure. Such as they are, however, they seem to us to warrant a trial, as the operation is comparatively simple and relatively safe, and offers some definite hope of cure of a disease otherwise incurable except through a still more radical procedure.

Before concluding we would like to refer the reader to an article by Arbuthnot Lane of London on the subject, "The Surgical Treatment of Chronic Constipation" (Surgery, Gynecology, and Obstetrics, February, 1908). We are of the opinion that in this paper Mr. Lane is dealing with much the same condition which we have presented here. He presents the symptom of constipation as the eminent characteristic of his article. In our experience while constipation is always present it is not the symptom which has brought the patient to the surgeon; instead, the abdominal pain, flatulency, and distress, which have usually led to the diagnosis either of chronic appendicitis or gall-stones, have called for surgical relief. Also Mr. Lane gives no description of the characteristic membrane which we have presented herein, but speaks simply of "adhesions" as found at various points of the colonic circuit. These adhesions he seems to find equally as prevalent about the transverse and descending colon and the sigmoid. This we have not been able to verify in any of our cases, though we have as a routine searched for them. We have also been able to find our pericolonic membrane in the course of three autopsies on patients dying of

other causes. In no case, however, thus far have we been able to find evidence of any such condition elsewhere than in the ascending colon and the adjacent portion of the transverse colon. The description, however, which Mr. Lane gives of the mechanics of his cases is classic. He recommends as treatment the excision of the entire colon followed by an ileosigmoidostomy, and reports excellent results. This treatment is rather too radical to receive general acceptance; yet we are ready to admit that in some instances it may prove advisable. If by the long-continued interference with peristalsis the muscular walls of the colon should have so far atrophied as to be unable to regain their tone after the mechanical restraint of the pericolonic membrane is removed, such a procedure is the only one left. In fact, as stated above, in one of our cases we did deem it advisable to excise the contracted and atrophic ascending colon. With an earlier diagnosis, however, and the free removal of the restricting membrane, as we have suggested, we believe such radical measures may prove unnecessary; yet it is well to remember that after our suggested procedure, measures to revive the sluggish peristalsis are important. Regular habits, antifermentative diet, occasional catharsis, and, above all, abdominal gymnastics and massage are important after-considerations. Such after-care has been insisted upon by us in every case we have operated upon.

DISCUSSION

Dr. James E. Moore (Minneapolis, Minn.): I have been much interested in this paper of Dr. Jackson because it covers some of the ground I expect to cover in my own paper. I hope Dr. Jackson is right, but I am not sure about it. He makes the point that the adhesions he spoke of caused ptosis of the colon. Gentlemen, you know that in these neurasthenics, who have ptoses of these organs, we do have these adhesions, and we also know that many of them do not have adhesions. So the question arises, Are not these adhesions

the result of ptoses rather than the cause? It seems to me that, inasmuch as the majority of these cases occur in neurasthenics, we shall find it difficult to make a diagnosis of these conditions. We will give Dr. Jackson credit for his usual diagnostic acumen and believe he has found the cause of this condition, but we shall be in a better position to decide how much good he has accomplished when he tells us what the results were in the cases he has reported.

We can operate on these neurasthenics, and do nothing at all but open up the abdomen, look inside, close the incision, and the operation, *per se,* does temporary good. It does not do permanent good.

A question I would like Dr. Jackson to answer is this, Are the patients he has operated on in the manner he has described relieved for any considerable length of time? If the operations are recent, they are simply neurasthenics, in whom the operation, *per se,* does good, whether you touch the colon or not. We dislike to meet these suffering neurasthenics in our surgical work, but are anxious to do more for them than we really can do.

Dr. Horatio B. Sweetser (Minneapolis, Minn.): I have had patients on whom I operated in the last year with a similar pathological condition, and I must confess I did not know what was the matter, or what to do. These cases were both women. One of them was a nurse in the hospital. She was a neurasthenic. I operated on both of them for chronic appendicitis. Neither one of them had any acute attack at any time, but they had attacks of pain, which would last for a few days, and then they would get well apparently. When I opened the abdomen I found the appendix bound down with little fine adhesions, and a membrane covered the whole ascending colon. I took out the appendix, but did not dissect off this membrane, as Dr. Jackson has done. I separated it, and it curled up. These patients improved markedly. It is fully a year since the operation was done in one case, and when I saw her last she was practically well. Recovery was not prompt. I thought I had done these patients absolutely no good. Fortunately, I tore off this membrane, thinking it was an adhesion.

I am very glad to have listened to this paper.

Dr. Archibald MacLaren (St. Paul, Minn.): I can recall two cases off-hand where I have observed the condition Dr. Jackson has just described, and to the best of my recollection they were perfectly relieved by the division of

this membrane without dissecting it off, and as I recollect the histories, they were of the type that Dr. Jackson has described.

DR. R. C. COFFEY (Portland, Oregon): In these cases we should direct our attention to the antecedent pathological condition. In all the cases of this kind I have seen, prolonged constipation has been a very noticeable and striking feature, and usually attended with prolapse of the colon. I have come to the conclusion that this membrane is the result of this condition, which, to a certain extent, disturbs the circulation, either by its mechanical influence through a loaded colon or by some direct influence of the toxins contained in the bowel, and I am of the opinion that it is an attempt to produce a collateral circulation in the obstructed venous return.

DR. A. M. POND (Dubuque, Iowa): I am very much obliged to Dr. Jackson for naming this condition, which I have encountered, and have really reached a point where, after listening to the history of these cases, I expect to find the same condition. I wish to confess, however, that I have been absolutely wrong in my theories concerning the formation of this membrane, if Dr. Jackson's deductions are correct. In doing work in the upper abdomen I have discovered fine, spider-web adhesions between the gall-bladder and the duodenum, which in very many cases have become vascularized. I believe the adhesions in this matter of attachment have been due to a diseased condition of the gall-bladder rather than to trouble arising in the duodenum because of the pain the man suffered in the upper abdomen. There is a striking similarity between the adhesions in the upper abdomen around the biliary tract and the adhesions we find in the colon. There is a history of mucus, and we have been calling this mucous colitis, and following the suggestion of one of our fellows, Dr. Summers, of Omaha, of relieving a kinked up position of the colon. I considered this was rather a splint of nature to protect the mucosa and put it in this position as a matter of rest, and that these adhesions or tissue proceeded from some disease of the inside of the colon, instead of being a distinct pathological condition of the outside of the colon.

I am very much obliged to Dr. Jackson for his paper, as I shall continue to study these cases with renewed interest.

Dr. Jackson (closing the discussion): What I have given you is an observation, and not an argument. I confess, I do not know at the present time what is the essential cause of this condition. Possibly, after I receive complete reports from the pathologist, I may be able to build up an argument, but it is not an argument at the present time. Whether the ptosis antecedes and is followed by this condition, or whether it is produced by it, I cannot say.

Dr. Pond said he made a diagnosis of mucous colitis in his case. It is not simply a mucous colitis when you get the formation of an adventitious vascularized membrane on the outside of the gut. The condition may have started as a result of chronic constipation, but of this I am not certain. Suffice it to say, when the condition is found it is an entity to which we may give the term pericolitis, and for which I am unwilling at present to establish any particular etiological factor. Furthermore, the presentation of my suggestion to remove the membrane is likewise an observation, and not an argument. I am not arguing for this procedure because, as Dr. Moore has suggested, my experience has not extended for a sufficient length of time to establish the point whether this operative procedure will be of value or not.

Of the five cases upon which I have operated three have been apparently symptomatically cured thus far, and all of them have been operated on in less than a year, showing the frequency with which these cases come under observation. One of the three cases symptomatically cured was a young woman who had lost twenty pounds, but since the operation has gained thirty pounds. She is free from pain, is married, and has been taking care of her household duties since that time.

As I am satisfied that this condition is an absolute clinical entity of its own, then the question arises, Can these patients be cured surgically? And if so, what method will result in a cure?

In conclusion, I wish to say that I presume all of you have read the article by Arbuthnot Lane in the American Journal of Surgery and Gynecology last February, in which he speaks of the surgical treatment of constipation. He speaks of these adhesions around the colon and of angulation of the colon, such as I have mentioned, except he does not describe the characteristic membrane I have referred to. He argues in favor of the removal of the colon for this diseased condition, which he simply calls chronic constipation.

The proposition occurred to me, if this is a condition which is serious enough to warrant the advocacy of complete excision of the colon, it is a condition worthy of consideration for the adoption of a measure less radical than that. This membrane has oftentimes appeared to me analogous to pterygium, in that it seems just as logical to advocate the removal of the eye for pterygium as it would be for Mr. Lane to advocate excision of the colon for chronic constipation.

GASTRIC AND DUODENAL ULCER

W. D. HAINES, M. D.

CINCINNATI, OHIO

Descriptions of the symptoms, course, duration, and treatment of gastric ulcer have been written, rewritten, and carefully revised. They are now gradually settling into a fixed place in medical and surgical literature; unfortunately, so much cannot be maintained for the concepts of the early and late pathology of ulcer.

The relative frequency of gastric ulcer as developed in the dead-room varies. Thus, in London, 4.6 per cent; on the Continent, 8.54 per cent; in the United States, 1.32 per cent of the cases in large series of post-mortem examinations showed ulcer cicatrices.

Grunfeld, of Copenhagen, in 1,150 autopsies found ulcer evidence in 11 per cent, but the percentage rose to 20 in the next 450 cases which he posted.

The frequency with which duodenal ulcer coexists with gastric ulcer, or is present as a distinct entity, is rapidly becoming established by operative experience rather than post-mortem findings. One-third of the acute perforating ulcers in Moynihan's experience have been duodenal, and the Mayos found this type of ulcer in over one-half of their perforations. Contrast these figures with the autopsy findings of Francine, who, in a series of 2,830 subjects, found 38 gastric and but two duodenal ulcers. The stomach

may digest itself after death (J. Lewis Smith), and other post-mortem changes may rapidly ensue, which will so obscure the true pathological picture as to render post-mortem findings erroneous, misleading, and worthless.

While we must not underrate the importance of post-mortem examination at the hands of a competent pathologist, still the deductions of the past based upon his experience are being rapidly reconstructed by biologic and biochemic examination of disease-processes in living tissue, and to-day we may rationally agree with the asseveration of Nirvana, that "death ends all," in so far as pertains to disease.

In the fetal state the pylorus extends to the distal opening of the common duct. The duodenum is a derivative of the foregut, and from an embryologic consideration is identical with the stomach, and should be classed physiologically with this organ instead of the intestine, as it usually is by anatomists.

The stomach in the embryo is nearly parallel with the long axis of the body, but as development advances the posterior surface becomes rotated in such manner as to form the greater curvature of the adult stomach, and the lesser curvature is formed by the anterior wall of the fetal state, which retains its general conformation; but the posterior wall of the primitive state becomes greatly distended, forming the fundus of the fully developed organ.

The pylorus and duodenum are completely surrounded by peritoneum in the embryo, and are freely movable, but as development advances the duodenum loses part of its posterior peritoneal covering as it curves about the head of the pancreas and becomes more or less fixed. That portion of the duodenum which forms the concavity is directed upward to the left and back to within two inches of the pyloric ring.

All save a small percentage (7 to 10 per cent) of gastric ulcers are located in the pyloric one-fifth of

the stomach-wall. Cannon has demonstrated that the kneading process of food takes place in the pyloric end of the organ, and this is undoubtedly one of the factors which determines the site of ulcer.

Nearly all duodenal ulcers occur in the first inch and a half of the wall, beginning at the pyloric margin, and here, as in the pyloric end of the stomach, trauma plays a definite part in determining the location of ulcer.

Although a true sphincter* is not present in the human pylorus, there is a sphincter-like action which impedes the passage of stomach-contents. This impediment is overcome by the muscular contractions of the stomach-wall, which forces the acid contents gradually, by intermittent jets, into the duodenum, striking its wall with some degree of force.

The acid chyme in the pyloric end of the stomach physiologically stimulates motor function and the normal inhibitory power of the pylorus to the too rapid passage of stomach-contents, thus preventing overcrowding of the neutralizing process which takes place in the duodenum.

Duodenal ulcer affects men twice as frequently as women. Explanation is sought in the anatomical arrangement of the first portion of the duodenum, which rises one inch higher in men, and is therefore less protected by the alkaline contents of the viscus.

The presence of acid chyme in the duodenum stimulates pancreatic and biliary secretion, and it is in this physiological picture of normal acid contents being forced through the pyloric outlet just so rapidly as the alkaline (pancreatic and biliary) secretions will neutralize them that we find the most essential feature in the prevention of duodenal ulcer.

The perversion of the stomach secretions and their retention over a natural period, plus diminished resistance of the mucosa lining the stomach, probably constitute the initial step in ulcer pathology. Mayo

*The pyloric canal of Jennesco has been referred to as the sphincter of the pylorus. It comprises the terminal three-fourths of an inch of the pyloric end of the stomach, and is singularly free from ulcer and cancer.

has well said it is the mechanics, and not the chemics, which are at fault, but this pertains to operative indications in chronic ulcer and not to the first statement in evidence leading to final judgment on causation, as it is sometimes quoted.

Germs (lactic, butyric, and acetic acid bacilli), normally held in leash by HCl, multiply in great numbers in ulcer cases, owing to the great decrease or complete absence of this essential constituent of normal gastric secretion. Nerve exaltation and increased motility follow, which in time give way to the physiological apathy of over-stimulated organs—that is to say, diminished resistance favoring separation of the muscular fibers, dilatation of the stomach and invasion of germ life.

The element of trauma is essential to the rounding out of this hypothesis, and this is in a measure supplied by the kneading process in the pyloric end of the stomach and the force with which the chyme strikes the duodenal wall when forced into this viscus. In one of the writer's cases which came to operation for relief of chronic ulcer symptoms, the acute symptoms began shortly after the patient accidentally swallowed a plum pit.

While pain is one of the cardinal symptoms of gastric ulcer, it must be carefully differentiated from pain accompanying other pathological processes in the upper right quadrant of the abdomen, notably disease of the gall-bladder, duodenum, and pancreas.

The size of the ulcer, the depth to which it has penetrated, the duration of the disease, the part of the stomach-wall affected, and the ability of the patient to withstand pain, are determining factors in the value of pain as a diagnostic feature in gastric ulcer.

Early in the history of gastric ulcer the pain or discomfort is increased immediately after taking food, and definite relief follows vomiting or lavage. An

aching referred to the region of the lower thoracic vertebræ is a relatively constant symptom.

The amount of stomach secretions is greatly increased, but it is so altered in character as to be of little value in the process of stomach digestion; motility is also increased, and it is this spasmodic attempt on the part of the stomach to force contents through the resistant pylorus, in the presence of perigastritis, which occasions pain of such severity that it is sometimes mistaken for the pain associated with cholelithiasis.

The presence of macroscopic or microscopic blood in the vomitus, when other sources have been eliminated, is conclusive evidence of the presence of gastric ulcer.

As the disease becomes subacute or passes into the chronic state, the entire clinical picture changes. Pain, which was spoken of as gnawing and general in character, is now, owing to the perigastric inflammatory changes, in close proximity with the great splanchnic plexus, referred to as severe and localized. Futile attempts on the part of the stomach to force the chyme through the pylorus ends in exhaustion of the muscular fiber and dilatation of the stomach wall, the process of dilatation being greatly enhanced by the combined weight of accumulated food and stomach secretions.

Extreme irritability is replaced by a degree of tolerance which permits of large accumulations of food. In such instances practically all the food ingested for days may together with quantities of secretions, be recovered by the stomach-tube.

Although these patients seldom bleed to death, the diminished resistance induced by the loss of blood and lack of nourishment leaves them easy prey for some intervening disease, notably tuberculosis and malignancy.

The pain of duodenal ulcer, unlike that associated

with stomach ulcer, is relieved by the presence of food in the stomach. Pain is greatest four or five hours after eating, a time when the acid stomach contents are being forced through the pylorus and coming directly in contact with the ulcer surface.

These patients complain much of gaseous distension, and as the pylorus is ill suited to the passage of gas, relief is sought in eructations or vomiting.

The dark, tar-like stool is symptomatic of duodenal ulcer, but the difficulties in eliminating sources of error in occult blood in the stool are so numerous that less dependence is to be placed upon hemorrhage as a symptom than in stomach ulcer. Differential diagnosis must include a consideration of the possibility of the existence of both duodenal and gastric ulcer in the same patient.

To recapitulate: The diagnosis of gastric ulcer rests upon the tripod of pain, vomiting, and hemorrhage; it must be differentiated from cholelithiasis, pancreatitis, disease of the right kidney, appendicitis, hepatitis, hemophilia, hysteria, and tabetic crises.

Duodenal ulcer is characterized by pain, eructations, and blood in the stool, and, like gastric ulcer, must be differentiated from the above pathological lesions, not forgetting that ulcer may complicate one of these processes, or *vice versa*.

It is to a correct reading of these symptoms, together with such assistance as the laboratory findings will render, that we must turn for a clear conception of gastric and duodenal ulcer. The complications of gastric ulcer are hemorrhage, perforation, and carcinoma; those of duodenal ulcer, hemorrhage, and perforation, malignancy being rarely found in this location.

Hauser, in 1885, demonstrated the atypical proliferation of glandular elements in the scar-tissue of healed gastric ulcer, and maintained this to be due

to the inhibition of normal function and the absence of tissue support surrounding the cells. This practically harmonizes with the cell autonomy theory of cancer, and greatly strengthens the plausibility of malignant change taking place in the base of chronic ulcer. Indeed, we take it that no argument is necessary before this society anent either the possibility or frequency with which cancer of the stomach has its origin in chronic ulcer. This was recognized clinically and confirmed by post-mortem examination nearly a century ago, but it was left for stomach surgery, with its concomitant study and demonstration of living pathology, to fix the percentage of cases in which carcinoma developed on the site of chronic ulcer.

Mikulicz was a victim of malignant stomach disease, and found ulcer histories in 7 per cent of the patients upon whom he operated for cancer of the stomach; the Mayos report 54 per cent of the malignant stomach cases operated upon by them (1905-1906) as having their origin in chronic ulcer; and Moynihan elicited ulcer histories in 72.1 per cent of a series of twenty-two cases of cancer of the stomach.

Carcinoma extends to other organs in three distinct ways; (*a*) lymph spaces; (*b*) blood-vessels; (*c*) continuity of structure. Lymphatic transmission is by far the most frequent and important in the consideration of the surgical treatment of cancer of the stomach.

Most and Cuneo have shown that practically the entire lymph supply of the stomach, liver, pancreas, and spleen is collected by a group of lymph-nodes, pancreaticosplenic, which are situated along the upper border of the pancreas. There are three separate zones of nodes between the stomach and the above group, to which the term "sentinels" has been given. They are usually enlarged early in the history of can-

cer of the stomach, and the gland-bearing tissue which contains these "sentinels" should always be removed in the prosecution of thorough operation for the removal of cancer.

The pancreaticosplenic group anastomoses with the lumbar nodes to become radicals of the intestinal trunks which conduct the flow to Pecquet's cistern, thence to the general circulation through the thoracic duct.

Induration of the left carotid and subclavian lymph-nodes was the first physical manifestation to attract the attention of an intelligent patient suffering with malignant right kidney. This was ten years since, and the writer has observed this same phenomenon in cases of cancer of the pylorus, splenic flexure and sigmoid, and was at a loss for explanation until after reading an account of the works of Most and Cuneo.

Rest, mental, physical, and functional, is the dominant note in the treatment of ulcer. Pawlow has shown that the secretion of HCl is due to nerve excitation of central origin; hence the importance of mental rest cannot be overestimated in the treatment of acute gastric ulcer. The patient should be placed in a darkened room, all visitors excluded, and a strict dietary enforced. This, combined with lavage and the administration of appropriate drugs to meet indications, if continued for a period of six weeks, will primarily cure all save a small percentage of acute gastric ulcers. Duodenal ulcer is more difficult to relieve primarily than gastric ulcer, but when relieved the resulting cicatrix gives less disturbance in the after-history of the case.

The treatment of typhoid fever, where perforation threatens, in vogue to-day, would almost be the ideal treatment for acute gastric and duodenal ulcer. This implies that one must be constantly on guard for per-

foration, and fully equipped for immediate operation should this emergency arise.

Reports of the operative treatment of perforation of the stomach and duodenal ulcer illumine some of the most brilliant chapters in modern surgery. Perforation is one of the most serious emergencies in surgical experience, and operation should be done as soon as possible after the diagnosis is established. The question of moving the patient is an important one, and if rupture occurs while the stomach is filled with food—and from personal experience we would say this is the time most perforations take place—a house operation is often preferable to the risk of further soiling the peritoneum and loss of time engendered by removing the patient to a hospital. The number of hours from perforation to operation will have a direct bearing upon the percentage of recoveries. The fewer the hours the greater the number of recoveries.

The oculist long ago observed that a corneal ulcer which perforated healed more readily than one which did not perforate. Explanation is found in the relaxation which perforation affords to the tense tissues—*rest*. In imitation of this principle, an instrument is pushed through the crater in the surgical treatment of chronic ulcer, after which the varicose vessels immediately surrounding the ulcer are ligated and the margins turned in and secured by one or two layers of serous sutures. A gastrojejunostomy to secure more complete rest completes the technic of an operation which is giving satisfactory results in our hands.

End-results in the surgical treatment of chronic gastric and duodenal ulcer are, in the main, satisfactory, but the development of new ulcer, the recurrence of ulcer symptoms, or malignant degeneration in the after-history of a small percentage of the cases of chronic ulcer subjected to gastrojejunostomy,

should admonish us that any operation devised solely for the relief of faulty stomach-drainage is not a causal operation, and that the more radical procedure of Rodman, excision of the ulcer-bearing area, is the ideal operation for the relief of chronic ulcer.

A greater operative mortality will follow this operation as compared with gastrojejunostomy, the difference being from 2 to 4 per cent in favor of the latter, but all of this increased mortality is not due to the time-consuming heavier operation of excision: some of the deaths must be charged to unfamiliarity with technic.

FOR DISCUSSION, SEE PAGE 312

MISTAKES IN DIAGNOSIS IN THE UPPER ABDOMEN

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In this brief paper no effort is made to elucidate obscure or moot points in diagnosis, but the intention is to point out some common errors that can and should be avoided.

It will require long and careful study and observation to make the early diagnosis of cancer of the stomach possible, and our diagnostic methods of pancreatitis and of some obscure cases of gastric and duodenal ulcer, are far from perfect, but it is not possible for us to clear them up at the present time.

The principal reason for mistakes in diagnosis in this region, as well as in all other parts of the body, is lack of careful and systematic examination. There are two special reasons why mistakes are more common in the upper than in the lower abdomen: First, palpation is not nearly so satisfactory in the upper region, for want of the facilities for bimanual examination afforded by the rectum and vagina below; secondly, the surgery of the upper abdomen is of more recent development than that of the lower, and it requires time to develop diagnostic methods, as well as to come to a thorough understanding of the pathology of a part. It took several centuries to develop the diagnosis and pathology of appendicitis,

notwithstanding the fact that post-mortems were being made. The older men present can readily recall the numerous discussions we had over pelvic cellulitis and hematocele before we learned about salpingitis and ectopic pregnancy.

My attention was called particularly to the subject of this paper by my experience in the following case, which came under observation recently.

An unmarried woman, twenty-four years of age, came to me complaining of "pain all over her abdomen" accompanied by nausea and vomiting. She located the severest pain in the epigastrium and gave a history of abdominal crises extending over two or three years. When I had gotten her in position on the table for examination and uncovered her abdomen, I found two scars, one in the right iliac region and the other over the upper end of the right rectus. She then stated that she had first had her appendix removed, but, this failing to relieve her suffering, she was operated upon for gall-stones, and no gall-stones were found. It required only a brief, careful examination to demonstrate that she had ptosis of all the organs of the upper abdomen, to which her crises were doubtless due. To make the examination complete a finger was passed into the vagina. The cervix felt quite soft, and, remembering her complaint of nausea, I inquired if she had menstruated regularly, and she stated that she had. Upon further examination the uterus was found to be evenly enlarged and the vagina to be of a deep-blue color. In answer to the direct question if it was not possible for her to be pregnant, she replied, "Oh, no, I am not married." I then stated positively to her that she was pregnant, when she naively remarked: "Well, I guess I had better get married."

It is very evident that in this case two mistakes had already been made, and that had I been content with the diagnosis of splanchnoptosis and failed to

make a systematic and thorough examination I should have failed to recognize the most important condition obtaining at that time.

This case also illustrates another common cause of mistakes in diagnosis, that is, a false history given by the patient. It is difficult to understand the workings of this girl's mind, for she evidently wanted to know whether she was pregnant or not, and yet tried in every way to mislead me by giving a false history.

In every case presented for diagnosis of conditions in the upper abdomen in which ptosis of the organs is found, it should be remembered that the patient may be neurasthenic, when the history is very likely to be unreliable. When this condition of splanchnoptosis is accompanied by a pronounced neurasthenia the average practitioner of today readily recognizes it, but these patients are not all neurasthenics when they ask for relief from suffering. Many of them are filling their places in life and have the appearance of perfect health, and it is among this class that errors of diagnosis are the most common. It is a frequent experience with me to have these patients present themselves after having had one operation, and sometimes a series of operations, performed upon mistaken diagnosis. Without going back so very far I can readily recall mistakes of my own along this line. Every patient and especially every female complaining of suffering in the upper abdomen should be most carefully examined to determine the presence or absence of this condition, for it is very common, and when present is liable either to give rise to a train of misleading symptoms or to mask the symptoms of other pathologic conditions present. Many patients suffering from splanchnoptosis have been operated upon for gall-stones, the diagnosis having been based upon a series of abdominal crises seemingly pathognomonic of that condition, only to find that no

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gall-stones were present and that the patient had been suffering from Dietl's crises.

While it is not safe to operate upon a patient for gall-stones without first having excluded splanchnoptosis, neither is it safe to conclude that gall-stones are absent when splanchnoptosis is present, for some patients have both, and many patients with splanchnoptosis have a cholecystitis demanding operation. I have operated upon a number of these patients and have very materially improved their condition. When a patient's abdomen is opened who has had symptoms simulating gall-stones, and a blue gall-bladder is found, it is needless to state that the gall-bladder should not be opened; but when it is thickened and white, or of the same color as the stomach, it should be opened and drained. This point is well illustrated by the following brief notes of a case upon which I have been repeatedly in consultation within the past few months.

The patient, a woman about thirty, is quite fleshy and difficult to examine, but a moderate degree of ptosis of the stomach, liver, and kidneys can be demonstrated. When I first saw her she was in bed in the hospital suffering from constant pain and most persistent vomiting. She was unable to retain food and was rapidly losing flesh. My diagnosis was Glenard's disease, and my fear was that she would become an emaciated, bed-ridden neurasthenic. I advised against operation, but her sufferings were so intense that her attendant, after having exhausted every known method of dietetic and medical treatment, operated upon her, hoping to find gastric or duodenal ulcer, gall-stones, or some pathologic condition that could be relieved, but nothing was found and the abdomen was closed. The patient improved enough after this to enable her to leave the hospital, but she was a constant sufferer. Some months later the doctor sent her to my office for examination, and

I could make nothing out of her case at that time but Glenard's disease. Last month she returned to the hospital, when I examined her again, but did not encourage operation, although changes enough had taken place in her symptoms by this time to suggest the possibility of new developments. However, at her earnest request her attendant operated again, and this time I was present at the operation. The only pathologic condition found beyond the ptosis before mentioned was a thick-walled gall-bladder of the same color as the stomach. This was opened and found distended with a plug of mucus so dense that it was extracted in one piece. A long tail of the same material was attached to this plug, evidently coming from the cystic duct. No stones were present. The lining of the gall-bladder was covered with a thick, white, fibrinous deposit. The gall-bladder was drained, and the patient, who is still in bed, has been freer from pain than she had been for many months before. While this last operation has been so far very helpful, it is not safe to conclude that the patient will be entirely or permanently relieved, because she had had very severe symptoms before the first operation at which insufficient changes were found to justify the operator, in his judgment, in opening the gall-bladder.

The evidences of splanchnoptosis, or of ptosis of any one or more of the organs, are so positive and so easily obtained that an enumeration of them seems almost superfluous, but the fact remains that many of these patients are being operated upon after a mistaken diagnosis. Every operator is now familiar with the movable kidney, but many fail to grasp the fact that this condition is very frequently accompanied by ptosis of other abdominal organs. In spare persons suffering from splanchnoptosis—and most of them are spare—inspection is very helpful. The upper abdomen is flattened and the lower correspondingly

protruding. The abdominal aorta can be seen pulsating in the epigastric region, where, under normal conditions, it would be covered by the stomach, and this terrible throbbing is a very constant source of worry and complaint. Before this condition was recognized this throbbing was spoken of by the older writers as venous pulsation. The liver is much more frequently displaced than is generally understood, and when such a heavy organ becomes unduly movable it is most certain to give rise to symptoms. It should be remembered that, although a right-sided organ, the liver extends well over toward the left side, or otherwise a left lobe, especially when misplaced, is liable to be mistaken for a tumor. The long extension of the right lobe, or Riedel's lobe, is by no means infrequent and is very liable to lead to errors in diagnosis.

So many of these patients are neurasthenic and so unsatisfactory to operate upon that we are prone to neglect them, but some of them need surgical care, and we have no moral right to conclude that a patient who is a neurasthenic is wholly a nervous case until after a most thorough examination and careful diagnosis has been made, for otherwise we are very liable to overlook some important condition amenable to surgical treatment.

Another condition which has caused many mistaken diagnoses in the upper abdomen is Pott's disease in its early stages when located in the middle or upper dorsal region. I have seen a number of patients who had been operated upon for the various painful diseases occurring in this region whose pain was entirely due to Pott's disease. The early and constant rigidity of the spine, so characteristic of tuberculosis, should be sufficient to prevent these errors when a careful and thorough examination is made.

DISCUSSION OF THE TWO PRECEDING PAPERS

Dr. Charles H. Mayo (Rochester, Minn.): With reference to the subject of Dr. Haines' paper, excision of the

ulcer-bearing area: It brings up a statement which Dr. Moore made in his paper, namely, that, after all, we have learned very little from the records of post-mortem work, and practically all advance in surgery of today has been made from living subjects and the examinations of living subjects, and not from the dead; that patients who die finally die of other diseases than the condition which originally started the chain of events that caused death, and this may be overlooked in considering the surgery of kidney tuberculosis. According to the records of the post-mortem room, we are told that in eighty-five per cent of the cases tuberculosis of the kidney is bilateral, but we know from our work on the living that in eighty-five per cent of the cases the disease first appears in a single kidney, and that if patients live long enough the disease will involve the other kidney in the proportion the autopsy records show.

In considering ulcer of the stomach, we must remember that the stomach is made up of various coats, and this area is not able to protect itself if the mucosa becomes involved, so that nature's final cure of ulcer is perforation. She cannot bring all the coats evenly advanced to the center until she does perforate; and until the ulcer has perforated we shall have a history of relapses, etc. Rodman has advocated the excision of the ulcer-bearing area in bad cases, and while it is true that a higher mortality attends this operation, yet when it is shown that in over fifty per cent of the cases cancer develops in ulcer-bearing areas, we should not attribute entirely that mortality to the greater operation primarily for the removal of this area, but should include with it the mortality incidental to the saving of the lives of many, many patients who might otherwise develop and die eventually of cancer. So we are now excising more and more the immediate ulcer, and in certain cases the Rodman operation is done, and while it has added to the mortality-rate, I believe in the end the technic will be better worked out, so that these operations will not give as large a mortality as they do today.

Dr. Haines (closing the discussion): If we could have written before every surgical society, and particularly before every pathological society, this short sentence, "The dead have no diseases," we should have made a material advance in our conception of disease.

The difficulty in making a diagnosis of either gastric or duodenal ulcer is considerable, despite the fact we have ac-

complished a great deal along this line. Dr. Rodman reported a case before the Pennsylvania State Medical Association quite recently wherein a diagnosis was made in New York by competent men of ulcer of the stomach. This diagnosis was confirmed in Baltimore by equally competent men and by the best internists in Philadelphia, and yet when he opened the abdomen he found the stomach absolutely healthy, so that the diagnosis is not easy by any manner of means.

The report by Robson of some five or six cases of malignancy of the stomach following a well-performed gastrojejunostomy for the relief of chronic ulcer in from one to three and five years, appeals to me as being one of the strongest arguments in favor of removing that portion of the stomach which contains the greatest number of ulcers, whose walls support less than one-tenth of the mucosa of the entire surface. When we hear from Mayo Robson, Moynihan, and the Mayos, the men who are doing a large amount of stomach surgery, that patients have recurrence of ulcer symptoms and recurrence of ulcer itself, or, on the other hand, may have malignant degeneration taking place at the base of the primary ulcer, for which the original operation was done, what good do you accomplish when you relieve the patient's symptoms, if he is left to die of cancer of the stomach?

PERITONEAL ADHESIONS

AMOS W. ABBOTT, M. D.

MINNEAPOLIS, MINN.

As the object of this paper is to bring out your views as to the best way of preventing and dealing with abdominal adhesions; adhesions resulting from tubercular and malignant disease and from the so-called chronic adhesive peritonitis are, for obvious reasons, not considered.

We can generally refer the cause of peritoneal adhesions of the kind under consideration to certain infections which obtain access to the peritoneum by way of the genital organs, or from inflammations of the appendix, gall-bladder, intestines, liver, stomach, and, occasionally, the spleen and kidney. Typhoid fever, with or without perforation, plays a rôle in this respect not fully appreciated. Prolonged drainage and the use of improper drainage material and unabsorbable sutures must be considered. Tapping, as formerly practiced, often led to broad strips of adhesions on the anterior abdominal wall. As a rule hernial sacs are surrounded by adhesions. Adhesions are not infrequently found remote from the site of inflammation; for instance, extensive adhesions about the liver edge or in the pelvis after appendicitis.

Traumatism and rough handling of the abdominal contents have been considered the cause of peritoneal adhesions. It is generally impossible to prove this in the human, because of other conditions existing at

the time of the operation which invalidate the proof. Moreover, it is astonishing how seldom we find adhesions about the field of operation; for example, after an appendectomy with rupture or an excision of gangrenous bowel. Moynihan remarks the absence of adhesions after gastro-enterostomy, and yet these operations necessitate a local rough handling far in excess of that practiced on the peritoneum in any ordinary operation in the abdomen; in other words, where the rough handling has occurred, we do not, as a rule, find adhesions. Blood-clots in the peritoneal cavity have been said to be a potent factor. In direct experiments on the lower animals as to traumatism and hemorrhage the results do not fully justify the inference. Evidence is accumulating that certain adhesions, notably about the gall-bladder and female pelvic organs, may form slowly, insidiously, and without discoverable cause. The histories of a number of our cases would indicate that severe blows upon the abdomen may cause extensive peritoneal adhesions.

I have found the situation of adhesions in the following order as to frequency: in the male, omental, appendiceal, intestinal, cholecystic, hepatic, and gastric; in the female, pelvic, omental, appendiceal, intestinal, cholecystic, hepatic, and gastric.

There are certain observations which we have probably all noted, but perhaps have not grouped together:

1. Extensive adhesions are found where there is absolutely no history of previous inflammation or traumatism.

2. Extensive inflammation may leave no evidences in the way of adhesions. As an illustration, Mrs. McK. had a violent pelvic inflammation with resulting pus. I evacuated over a quart. Ten days afterwards the abdomen was opened, and there were absolutely no adhesions and no evidence of former in-

flammation, except a small mass of inspissated pus on the right broad ligament.

3. It is a matter of common experience that in operations involving the separation of adhesions it is impossible to tell to what extent the adhesions will recur.

4. It is also impossible before the abdomen is open to diagnose the exact location and extent of adhesions, except possibly those in the vicinity of the uterus.

5. We cannot tell after an operation whether adhesions have formed or recurred, except by excluding other conditions even when pain or obstruction are symptoms.

6. Adhesions sometime eventually liberate themselves, as evidenced by the inflammatory masses we often find upon the surface of various organs, notably the large intestine, the uterus, even after purposely formed suspension adhesions, and occasionally the liver. It is indeed quite certain that adhesions formed purposely, or otherwise as the result of an aseptic operation, are not as durable as those formed by disease.

7. We have no means for determining whether or not adhesions, that have formed will, at any time, free themselves.

8. Below the stomach, adhesions to the anterior abdominal wall are rare except of the omentum, and these seem to be confined largely to abraded or uncovered surfaces. Direct adhesion of the anterior abdominal wall to the stomach is the rule in slow perforating ulcer. Adhesion of the liver to the diaphragm is not very rare. The cause is often a matter of speculation, certainly the history points generally to a remote inflammation as, in the majority of cases, there is no previous record of abscess, traumatism, or other serious disease of the liver.

9. It is remarkable how few symptoms, and in

some cases an entire absence of symptoms, will accompany the extensive agglutination of the intestines, intestinal digestion not being interfered with, with absence of constipation and pain. The pronounced symptoms—severe pain, vomiting, and constipation,—are produced by adhesions which limit the excursions of movable or distensible organs. When otherwise situated extensive adhesions often give rise to no pain or other symptoms, and therefore do not invite surgical interference.

10. Acute inflammations of the peritoneum are followed by fewer adhesions, and these are likely to be of a fibrillary character, while chronic inflammations produce more numerous and denser adhesions.

11. Benign tumors are not prone to form adhesions unless they become infected or are meddled with by tapping or otherwise.

12. When obstruction of the bowels from adhesions will occur, is largely a matter of chance,—it may be days or years, although the adhesions are formed undoubtedly in most cases soon after the traumatism or infection.

Taking these observations together we find that the relation of conditions and symptoms in abdominal adhesion is a maze of contradictions. When symptoms are present, they are those of an irritation of the organ to which they are attached, and stimulate the diseases of the respective organs; fever, however, and muscle-tension are notably absent.

Mr. N. had excess of hydrochloric acid, absence of lactic acid, pain and tenderness over the epigastrium, frequent vomiting, and loss of flesh. Operation showed a dense thickening and shortening of the gastrohepatic omentum.

Mrs. A. had constant vomiting, acidity, epigastric pain, tenderness over the mid-region of the stomach near the lesser curvature. Opening the abdomen showed a dense scar at the site of an old ulcer.

Mrs. L, had spasmodic contractions of the diaphragm and vomiting. The entire upper surface of the liver was apparently adherent to the diaphragm.

Mrs. W. had great loss of flesh, epigastric pain, hyperacidity. Condition found: the duodenum firmly attached to the lobus quadratus of the liver; no present evidence of duodenal ulcer.

The diagnosis between adhesions to organs and disease of the organs themselves, is not always easy. There are, however, usually certain symptoms of diseased organs which are not found when adhesions alone exist; for instance, in adhesions to the gall-bladder, pain is apt to be more constant, far less severe, and more influenced by exertion than in case of gall-stones, while in cholecystitis the tenderness is more acute, and fever is present. Pain in the region and exactly like that of appendicitis, except more continuous, is unfortunately a common complaint after the removal of the appendix. This pain contrary to general belief, is seldom due to adhesions.

Treatment.—In all ordinary forms of peritonitis, as it is the custom to overcome the disease as rapidly as possible both medically and surgically, it is probable that not much more can be done than we are doing to prevent pre-operative adhesions.

When operating, what shall we do to prevent the occurrence of adhesions? While we do not know the exact results as to the ordinary handling of the abdominal contents, we shall at least be on the safe side if we use great carefulness. In 1901, in a paper upon "The Immediate Effects of Exposure of the Peritoneum," read before this Society, I cited several experiments on dogs showing that at a room-temperature of 72° F., the temperature of the intestinal surface may drop 15° in twenty minutes, and the peritoneum become dried, wrinkled, and gray. Proper protection by moist, warm sponges is therefore indicated.

We cannot see how any certain position of the patient would lessen the liability to adhesions. It is possible, however, that a frequent change of position may be of value.

In case adhesions already exist at the time of the operation, which have given or are likely to give trouble, how can we best dispose of them to prevent recurrence? Artificial membranes have not given good results nor has the filling the abdomen with fluid or covering the parts with oily substances been satisfactory. The most important step in the technic to this end, is to cut and not tear adhesions, when possible. This is not always so important with omental adhesions to the abdominal wall, but in the case of the liver, bowels, spleen, and stomach, the organ itself is liable to be torn instead of the adhesion. Adhesions, if cut, leave less raw surface. contract, and atrophy. If broad enough to make it advisable, the sides of the adhesions may be drawn in by suture or covered by omentum. The large raw surface made by separating wide, firm adhesions may sometimes be covered by drawing the peritoneum over it, or a piece of omentum may be transplanted thereon.

Unless there is an acompanying disease, of organs, the certainty with which we can prevent the formation or recurrence of symptom-giving adhesions must be the guiding indication as to whether surgical interference will be an advantage to the patient.

DISCUSSION

Dr. Henry T. Byford (Chicago): Since I have come to differentiate adhesions which occur and remain as the result of sepsis, from other kinds of adhesions, I have had a clearer view of these cases. Adhesions that form from septic diseases or after unclean operations are firm and lasting; those following the careful manipulation necessary in clean operations are transitory. In the former physiological rest and immobilization of the parts are often necessary; in the latter a stimulation of the function of the parts and of the motility of the intestines, will cause absorption of the exudate and

stretching of the remaining adhesions. When we can eliminate sepsis adhesions will not form so often.

Dr. B. B. Davis (Omaha, Neb.): If in all cases of post-operative adhesions severe symptoms were produced, I am afraid the field of abdominal surgery would be very limited, because it would be so very discouraging. I believe that a very large number of our operations are followed by more or less adhesions ultimately, that in most cases the symptoms are very persistent, and the reason the adhesion or adhesions produce symptoms is because of the extent of their location.

As regards the pulling and kinking, etc., upon the parietal peritoneum or between the loops of intestine: For a long time I have had a feeling which has been generally shared by others, that the loosening up of adhesions which we think are going to trouble us is an exceedingly unsatisfactory procedure, in that new adhesions are bound to form, and, as Dr. Abbott has pointed out, if we cut an adhesive band, instead of having one adhesion afterwards we may have two. I have several times had occasion to operate for adhesions that were causing trouble. If we loosen these adhesions carefully, and, as far as we can, cut bands, producing as little trauma as possible and without disturbing the viscera in the region of the adhesions, we are not so likely to get adhesions that are going to do special harm, and we do not care if post-operative adhesions should occur. By studying our cases carefully, going over the band of adhesion and covering it with omentum, if possible, and not disturbing the viscera, so that there is not likely to be kinking which may produce trouble afterwards, in most of these cases we can get favorable results. But I do believe that adhesions are five times more frequent than the disagreeable symptoms produced by them. Many times we find adhesions which do not produce any deleterious effect whatever.

Dr. D. S. Fairchild (Des Moines, Iowa): I have always felt that I had no reputation I could afford to risk in operations for adhesions in post-operative cases, unless it was in a case of absolute obstruction of the bowel.

I remember a case, four or five years ago, operated on for cholecystectomy, by Dr. Bevan of Chicago. The man came to me some time afterwards suffering from symptoms due to adhesions or to neurasthenia—I did not know which at the time. I advised him to go to some other physician—I am quite willing to turn over these cases to my medical or

surgical friends. The man went to Rochester, Minnesota, which is the surgical Mecca for people in Des Moines, and Dr. W. J. Mayo operated on him. He came back to me saying that his symptoms had returned; that the operation had not relieved him. I told him to go to Dr. John B. Murphy, of Chicago, who was considered good on adhesions. He not only went to Dr. Murphy and was operated on, but he came back to me with his old symptoms, and he has them yet, so far as I know.

In another case that came under my observation I had operated for appendicitis, several years ago. When the patient's abdomen was uncovered, there was a beautiful display of scars. This patient had been operated on at nearly every clinic in Chicago for the relief or removal of adhesions. When he came to me a few months ago with a greatly distended abdomen and with obstructive symptoms, he refused to submit to any further operation. Finally, he felt something break away and his bowels moved freely. This man now felt he could trust to Providence rather than to surgeons for the relief of his adhesions. That has been the experience I have had with these cases of adhesions, and I imagine it is the experience that other men have had, so far as the cure of the adhesions is concerned. When I am confronted with one of these cases, unless there is absolute obstruction from adhesions, I am quite willing to send the case to my neighbors.

DR. ABBOTT (closing the discussion): I have nothing particular to say except that there are certain of these cases that we cannot turn down. They come to us with pain and so much suffering that something must be done. The object of the paper was to get from your experience something that would be of service to these cases.

THE VERSATILE OMENTUM

FREDERICK A. DUNSMOOR, M. D.

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The importance of the functions of the omentum in surgical practice is too frequently overlooked. We have been accustomed to regard it as an apron with two outer layers of peritoneal membrane between which were numerous glands, some fat, and a rich supply of blood-vessels. It is supposed to act as a great protector of abdominal viscera against injuries, heat, and cold, and to equalize blood-pressure through its immense venous reservoirs. We know it is a source of annoyance to the operator through its persistence in trying constantly to attach itself to any wound in the abdominal wall, and it frequently eludes the surgeon's vigilance and becomes entangled in the peritoneal sutures, thus adding to the number of post-operative adhesions.

The path of the lymph-stream from the abdominal cavity is largely by the omentum. Lodi states that the omentum plays an important part in the absorption of both microörganisms and solid particles in the peritoneal cavity. Durham found in an animal killed twenty minutes after an intra-peritoneal injection of bacteria that the omentum contained bacteria, while the peritoneal cavity was sterile on culture.

When the omentum is irritated by any cause, there is a transudation onto its surface of an exudate, composed of white blood-cells and fibrin, which produces a stickiness that enables the omentum to become at-

tached to or to encapsulate the offending part. If pathological germs are too numerous or virulent, then permanent adhesions are formed or local abscesses may result. It is believed that the staphylococcus albus appears first after an injury, and by its rapid dissemination and minor irritation, induces the rapid transudation of phagocytes from the omentum sufficient to overcome the more virulent germs which appear later. The busy omentum seemingly possesses curiosity and may be found investing any inflamed organ or denuded gut. Its sticky quality makes it very competent to adhere to intestines which have been wiped or handled by dry gauze. On making an abdominal section, the rigid or adherent omentum points without failure to the pathological centre, and it is time saved to immediately recognize the reliability of such a guide. The knowledge of the ability of the omentum to resist the germs of infection, should not make the operator careless in separating omental adhesions, since they too often simply form a lid or covering for immense pus vaults, filled to bursting even though walled off from the general peritoneal cavity.

The experiments of Emanuel J. Senn, in 1903, with dogs, show that the omental membrane of these animals is not competent to combat infection or leakage from intestines as it is in human beings. Though the omentum in dogs is of greater area in proportion, it is much thinner and less richly furnished with glands than the human apron. It is known that in the human or other animal, the omentum is capable of taking up one-half of one per cent of the body-weight of fluids per hour, partly by the blood-stream and partly by the lymphatics. This quality makes the omentum a valuable substitute for the drainage-tube. The absorption of intraperitoneal fluid is proportionate to the activity of intestinal peristalsis. Reduction in temperature of the peri-

toneal cavity diminishes the absorptive power of the omentum, thus contra-indicating the use of the ice-pack over the general abdominal cavity during the early stages of pus-formation. Rogers demonstrated the protective rôle of the omentum in guinea-pigs two months after he had removed the omentum, by injecting a virulent culture of staphylococcus aureus, with death in twenty-four hours, while controls of the same weight with simple laparotomy received the same culture and survived. Experiments by De Renzi and Pirrone show that the circulation of the spleen may be cut off or tied off, and the omentum will envelop and absorb the spleen, while if the protecting action of the omentum be prevented, the experiment results in death to the animal. Other findings show functional relations between the spleen and omentum.

It is my habit to use the omentum as a patch for a wounded intestine, denuded peritoneum, or to fill in ulcerations which are not readily or safely closed. When large pus-cavities are opened, after removing the pus and wiping contaminated parts with iodoform gauze, the omentum is, in all cases where possible, made to adhere to the infected part, instead of using a drainage-tube.

In each and every case where my operations are complicated by suppurating areas or penerating intestinal wounds, leaking ureter, or obstruction of the bowels, the part infected is enveloped as far as possible by the omentum. I often cleanse the pus-cavities with peroxide of hydrogen, or leave a light sponging of iodoform to inhibit the pathological germs until the omentum has time to marshal its reparative forces. In post-cecal appendicular abscesses, with free flowing serum, I insert drainage posteriorly for one or two days. The question of drainage is often solved for me by the condition of the omentum. If the omentum is large, thick, and free, and easily plastered to the infected area, I do not drain. If thin,

short, curled up, or already much damaged, I drain from the most dependent part of the infected area, and, when possible, keep the outer end of the tube the lower. To me the omentum seems an entity. It apparently searches for opportunities to render first aid. This very virtue contains its element of danger. Too often the adhesions formed through its protective efforts are permanent, and may restrict free peristalsis, and even cause obstruction of the bowels. The reverse is true when the good offices of the omentum are used to insert between divided adhesions formerly connecting loops of intestine. In these cases, as resolution progresses, the adhesions disappear. In progressive tubercular or malignant disease of abdominal organs, when the utility of the omentum is finally overcome, ascites appears and warns the surgeon of damage to his most efficient aid. It is then that celiotomy should be made in the less serious affections and competent and complete drainage of the free fluid made. The omentum should be liberated or unrolled, and teased down in the abdomen as far as possible until its function of absorption is restored. In firm adhesions about the ovaries I often sever the omentum close to the enveloped organ, leaving the distal portion to assume the functions of the local peritoneum, and when the omentum is not long enough to reach freely into Douglas' cul-de-sac, a patch may be severed and transplanted like a skin-graft.

Illustrating types of condition in which these functions were most beneficial, I have selected three cases from hundreds in which I have utilized this most important organ.

CASE 1.—Operated on April 15, 1904, for the removal of a uterine fibroid, complicated with a long-existing pus-tube, the vitiated bowel-wall gave way, tearing completely across the sigmoid juncture with

the rectum. There was so much loss of the structure of the intestinal wall, due to the degeneration from contaminating pyosalpymx, that an attempt to suture the gut proved fruitless. There was no peritoneal membrane left on the wall, and the muscular coat would not hold a suture. A Murphy button was introduced and held the approximated ends, while an envelope was made of omentum, extending over two inches along the bowel and sutured around the anastomosis of the same. A colostomy was made in the left inguinal region, and fecal evacuation followed through the artificial anus. Three weeks later, feces were expelled by rectum, but the button was retained, and explorations from above and below showed that all the normal coats of the bowel had separated, and the sleeve of the omentum made a pouch detaining the button. This was finally removed by the use of long forceps introduced through the artificial anus. The colon was then detached from the abdominal wall, and the wound in each closed. This patient could not be said to have an uneventful recovery, since on October 18, 1904, I made a trip to Milwaukee, and with Dr. Fitzgibbon operated on her in Trinity Hospital for appendicitis. Again, in February, 1905, I drained Douglas' pouch for a purulent accumulation. On December 13, 1907, I operated on the right kidney for renal calculi complicated by nephritic abscess.

The patient at this writing appears to be in normal health. She perfectly understands the pouchy condition of the bowel and watches closely the consistency of her dejection, constantly keeping them semisolid.

Case 2.—Dr. S., 64 years of age, 6 ft. tall, weight 250 lbs., teetotaler and perfect habits, active in practice, was a sufferer for years from hepatic colic. Following a severe attack with high fever, his temperature going above 105° F. for several days, the doctor entered the Swedish Hospital with diagnosis of

empyema of the gall-bladder and biliary calculi. Operation was done the following day. The gall-bladder was adherent to the posterior abdominal wall, and was reached with the greatest difficulty. After walling the abdominal tissues with gauze, the gall-bladder was aspirated of a large amount of bloody, feculent pus, after which many angular gall-stones were removed. The patient's condition was such I did not attempt to remove the gall-bladder or even free it from its adhesions, but, instead, fastened a rubber tube, one-third of an inch in diameter, into the gall-bladder, and completely enveloped the tube with the omentum up to the anterior mural peritoneum. The rubber tube came away on the tenth day, but the fistula made by the omentum remained patent five weeks, and has since reopened several times. The point is, the ability of the omentum to make a biliary duct from the posterior to the anterior wall perfectly protecting the general peritoneal cavity against a virulent infection then existing in the gall-bladder.

CASE 3.—Miss Louise T. entered the hospital on August 26, 1908, with an attack of appendicitis. She had a history of having swallowed a pin and a needle some weeks previous. The pin had been found in the stool three weeks after being swallowed, and the parents supposed the needle had also been expelled with the feces. During the operation for the removal of the appendix, I noticed a bunch of the omentum. Obeying my rule to follow the index of the omentum, I found the needle, which had escaped entirely from the intestinal tract and was enveloped in the omentum.

In conclusion, I may be allowed to say—

1. That it seems sensible to follow natural and physiological efforts in our attempts to cure.

2. That the functions of the omentum to combat infection and drain dangerous elements from the peritoneal cavity, are well established.

3. That we should aim to secure the assistance of such functions, and, at the same time, use our ingenuity to prevent permanent adhesions which might be harmful.

4. That we should deprecate the wasteful amputation of parts of the omentum appearing redundant or occupying the hernial sac.

5. That damaged over affected or strangulated portions of the omentum should be removed, in order that greater utility may be possible from the portion remaining.

DISCUSSION

DR. DANIEL N. EISENDRATH (Chicago): I believe that everyone who has done a great deal of abdominal surgery, comes to rely on the omentum as a sort of index to where infection has been. It seems to be almost like a protecting mother hen that covers her chicks under her wing. I had occasion, just before leaving Chicago, to see another instance of this. I operated on a boy who had symptoms of appendicitis, but whose chief symptoms were those of a moderate degree of intestinal obstruction brought about by eating. I have had the experience several times lately of young children brought to me with appendiceal abscess located down in the pelvis, which had a tendency to produce kinking of some of the coils of intestine lying in the pelvis, causing obstruction, so far as gases were concerned, but allowing fecal matter to pass. I had a beautiful example of this four weeks ago, so that in this case, on account of a considerable degree of distention of the abdomen, the boy having been sent to the hospital with a diagnosis of peritonitis on account of distention of the abdomen, I thought the boy had an abscess located in the pelvis. I inserted my index finger into the rectum, and thought I felt resistance high up in the cul-de-sac. I made an incision as low down as possible, along the right border of the rectus, went into the pelvis, and was astonished to find nothing in the pelvis. The omentum presented itself in the wound, and I stated at the time that where the omentum points, an inflamed appendix is liable to be close to it. I followed the omentum, which had grasped the lower end of the cecum, and the appendix was lying cecally.

DR. J. W. ANDREWS (Mankato, Minn.): It is wonderful

how much the omentum will assist the surgeon in protecting the parts he has operated on, so that we have come to learn that, after an operation, if we can get a fold of omentum and bring it well down over the parts we have operated on, we shall feel safe that the patient will get along without further infection.

I have one case which is of considerable interest to me because at the time I knew much less about the office of the omentum than I do now.

A young woman, believing herself pregnant, inserted an ivory penholder with so much force that it passed through the uterus into the abdominal cavity. She was soon afterwards taken with pain and considerable elevation of temperature, but after a few days the pain practically subsided, but not completely, and the fever was less, and it was several days before I could make a diagnosis on account of the fact that I was unable to get a history. Finally, I got a history of the case, and then my diagnosis was easy. I opened the abdomen and found this penholder as beautifully enveloped by the omentum as one could have done it with his hands, and I am not sure how long it remained there; but it was beautifully enveloped and shut off otherwise from contact with the intestines or other portion of the peritoneum.

DR. DUNSMOOR (closing the discussion): One point I wanted to bring out particularly was with reference to drainage. The question of whether to drain or not is frequently decided for me by the condition in which I find the omentum.

With reference to the formation of post-operative adhesions: When adhesions are divided we can push the free margin of the omentum between the parts and give adhesions which do not obstruct. Usually, the adhesions which result in obstruction are those which are forced down into the bottom of the pelvis, kinking the gut.

THE PRESIDENT: Is it not a fact that adhesions in the lower part of the abdomen not infrequently produce torsion of the omentum?

DR. DUNSMOOR: The adhesion of the omentum, that is, the protecting part, is nearly always on the surface. If loops of intestine drop into the pelvic cavity the omentum seems to come on top of the loop, but it is a kink in the bottom of the pelvis which causes obstruction.

THE SURGEON AND HIS IDEALS

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The men of a former generation, in spite of the lack of schools of higher learning and professional advantages, were taught from necessity the things that were to develop their character. In earlier days the only rivalry was to see who could do the most for humanity. Men formed genuine friendships, and what they lacked in scientific knowledge they made up for in a broad sympathy for fellow-man. In our profession the Grosses, Hamiltons, Motts, Sayres, and a host of others were men of this type. These names, which are now but a memory, would shine to-day by comparison with those who occupy the prominent positions in the profession. Their physic was crude and bitter, but the kindliness with which it was administered made it palatable. When the doctor of the old school took his departure humanity lost a friend. From these men the young received their inspiration; they were great in spite of lack of opportunities. With all the wonderful discoveries in medicine and surgery, we have lost something of a precious inheritance. Far better that the whole profession should be wiped from the face of the earth and never more be heard of, if we are to forget our ideals and what they stood for. To the surgical profession of to-day come difficult problems, not alone those pertaining to their professional work, but problems of a different character,

which must be considered in their relations to the ethical and economical world.

And in this brief paper I hope to entertain you with a few plain words chiefly along these lines, and leave for others the professional part for which this meeting has abundantly provided. To those who love and feel it an honor to be associated in the membership of this esteemed body of men, it is only necessary to say that our usefulness as an organization depends largely upon how much unselfish effort we put forth to sustain a high standard for professional and ethical work. Is there anyone here so foolish as to believe that serious wrongs do not exist, or that time will adjust matters without strenuous efforts on our part? Can we feel secure of an honorable future for our profession? Carlyle has said, "It is wonderful how long the rotten holds together, so long as it is not stirred up." In spite of open discussions and protests by the profession, the evils we deplore continue.

In this age of active commercial competition and enterprise, when the greed of the dollar destroys the man, when success in most things is measured by the dollar standard, when reputations and characters are being submerged, when youth and ambition is now rarely satisfied with less than the prospect of a money reward, when the chief effort of society seems to be to acquire wealth, regardless of how it is done, is it any wonder that rules and codes of ethics are cast aside if they are in the way?

There exists in the surgical profession evils brought on by this pernicious philosophy of life—evils which we all recognize, but from which we seem unwilling to rid ourselves. If we take account of what we have inherited we shall find that much of the traditional integrity of the profession has disappeared. The overcrowding of the surgical profession makes the struggle for practice steadily greater. Young men

are attracted by the greatet possibilities in surgery, and the larger rewards in rich fees. In most medical classes the larger number of students are thinking of surgery. The surgical clinic has the greater attraction for them, and most every young man graduating nowadays intends to follow surgery as soon as he leaves school.

The profession is crowded with a lot of unprepared men struggling for an existence. The present tendencies destroy our ideals, and we are gradually losing the respect and confidence of the public. There is no longer the unselfish devotion to profession for its own sake. The surgeon of broad intellect and generous character has been supplanted by a different type of being.

With all the blessings that Lister brought to us, there came also disadvantages. Aseptic and antiseptic surgery has permitted an influx of unworthy men to enter the profession, because now that one may open into the abdomen with impunity we see operations daily performed by men better fitted for barbers than surgeons. Not alone does the public, but the profession as well, suffer from these incompetent men.

To refer to the present-day evils is a delicate matter, for there is always danger of hitting someone whom you would not like to wound. The improved educational standards now required ought to have a good influence for the uplift of the profession, but education alone does not make honest men. The professional conscience needs to be aroused. The practice of dividing fees is on the increase, and the competition among the commission surgeons is becoming keener every day. This practice seems to be more or less prevalent in most parts of the country; in some instances, men with otherwise good reputations are engaged in it. It makes a coward of the

physician and degrades the surgeon. The practice will not cease until the public is thoroughly aroused and made familiar with it. To formulate rules of conduct for the profession whereby one may hope to make an honorable living and compete successfully for the largest rewards in practice, is a task of tremendous undertaking under the present conditions. It is now every man for himself, and the survival of the most unfit in many instances.

Frequently the young surgeon gets a bad start. His education is tainted by the bad influence of his teachers. The medical profession as a whole should take more active interest in medical schools. Political and other pulls have altogether too much to do with the filling of positions on medical faculties. The character of the teacher is more important than any other feature connected with the school.

Faculties are too often made up of men poorly fitted by nature, as well as by education, to perform their duties. Many of these men are self-seeking, of jealous dispositions, with abilities not equal to their ambition, and use their position simply as a means of fostering their own selfish interest. They embody the Italian proverb, "If you would succeed, you must not be too good." Big fees and rich patients are their specialties; they flatter themselves that this is an evidence of professional ability. It is a discredit to many of the medical colleges to-day, because of the fact that in the faculties are found men notoriously disreputable, who simply hold their positions by virtue of some pull. There is far too much politics in medical matters in general, and positive inefficiency characterizes a large majority of the clinical instructors who waste the time of the student. A student's ideas of the profession are formed largely by his teachers and his environment. If college professors are guilty

of irregular practices, it is not likely there will be developed a high sense of honor in the class.

A certain class of surgeons is responsible for an increasing number of poorly equipped hospitals for surgical work in the country districts. These hospitals bear about the same relation to the well-equipped hospital that the corner drug-store in a resident district bears to the well-equipped pharmacy of the down-town. They are in most instances a nuisance. Many of the larger hospitals do not exercise sufficient discrimination in extending operating-room privileges, and as a consequence there is a great deal of bad surgery performed by men who should not be allowed the use of the operating-room.

Even among qualified surgeons there is too much indiscriminate surgery being done, and much of it results in harm to the patient. If the physician were more often consulted and were taken into the confidence and council of the surgeon and patient, it would have a wholesome effect and would frequently act as a restraining influence to the overly ambitious surgeon. The infrequency with which the surgeon consults with the physician is one of the evils which is to be deplored. The responsibilities imposed on a surgeon are greater than in any other profession, and since the life of the patient is entrusted to him with a free hand, he should therefore be a man with the highest sense of honor. If for any mercenary or unworthy motive he abuses this trust, he degrades his profession and becomes an enemy to society.

Until the value of an operation has been demonstrated and accepted by the masters of surgery, no other surgeon has a right to tamper with the life and health of a patient by doing operations of doubtful benefit. One of the great wrongs is the frequency and willingness with which men undertake operations

of whose value they know little. "They rush in where angels fear to tread."

Even though an operation is not dangerous in itself, unless it is reasonably certain that good will come of it, it should not be undertaken. How often an Alexander's operation, a divulsing and curetting of the uterus, resecting and decapsulation of ovaries, the various operations for suspension of the kidney, gastro-enterostomies, exploratory incisions, and so on, are performed without any benefit and frequently result in harm. I would not say these are always done for the fee, but, rather, from lack of proper surgical understanding.

Another evil of to-day which does a great injustice to the profession, is the failure of surgeons to recognize the limitations of operative work in malignant diseases. I believe there would be fewer operations along this line if the surgeon freely and honestly explained to the patient in certain cases that there was absolutely no hope of saving life, or even prolonging it. The patient is too often lulled to sleep with a lingering hope that he may recover. I would not for a moment discredit the efforts of honest surgery to save life or lessen suffering, but it happens too frequently that hopeless cases are operated on with an implied promise of cure. For a man to accept a fee under such conditions is to make of him a felon; and he is guilty before the law of his country.

Whether it be the penalty of greatness, or an ambition to be known, advertising is quite common. Well-edited articles in newspapers, magazines, and other lay journals appear from time to time announcing the wonderful operations and skill of surgeons, and these articles are even so bold as to mention names, to the discomfiture of the whole profession. Again, the practice of sending out so much cheap, worthless literature in the form of reprints is a waste

of time and an abuse of the mails. There is too much suggestion about the surgical clinic being run as an advertisement for the surgeon. With an audience of gullible and half-baked doctors, it is amusing to observe how much grand-stand play and vaudeville performance the clinic affords. Many of the best surgeons are keenly sensitive to this condition of things.

The clinic should be a place for instruction for the physician, as well as the surgeon, but a three or four weeks' attendance there should not qualify one as a surgeon. All over the country are to be found men attempting surgical operations without any other qualification than a few weeks' attendance at some of the big clinics.

Some of the operators are so anxious and willing to operate on the poor gratis, under the guise of charity, that they send out circular letters to the doctors in neighboring states, inviting them to bring in their poor and have them operated upon free of charge at the clinic. There are too many influences at work to cheapen the value of surgical services. A large class of offenders are those who are employed by corporations, casualty insurance companies, the lodge doctor, and the subservient railway surgeon who offers his services for a railway pass.

There is a spirit of jealousy in the profession that is greatly to be deplored. Sometimes it is almost malignant, and is one of the things that destroy the joy of good fellowship. It seems there is more of this among doctors than any other class of men. It is surprising what small matters will sometimes disturb the harmony among them. We are altogether given too much to little petty jealousies, and are too hasty in our judgment of one another. Then, again, one cannot help but notice the great amount of fulsome flattery that is here and there extended, and to receive this patronizing praise is nauseating to a self-

respecting man. A criticism by a broad, generous man will never harm; but we are annoyed by the mutterings of the gossipy small men, the pismires of the profession. There is not enough appreciation for the quiet workers. The applause and attention is given mostly to men who make the greatest noise, and this condition of things sometimes disheartens a deserving man. Most of the best things in surgery have been developed by men frequently not well known, and too often the men with big reputations claim as their own something that has been produced by these men. We have in every large city young men desirous of doing research work, but through lack of funds are obliged to devote their efforts to other lines. This class of men should be encouraged and helped. It is shameful that in a city of this size so little work along these lines is being done. If necessary, the surgeons should contribute from their own pockets to establish and support laboratories for original work.

To correct some of the evils that are most prominent is not an easy matter. Neither Dr. Optimist nor Dr. Pessimist can do it, for while we are far from being what we should be, we are not on the road to ruin and damnation. We should discourage men entering the surgical profession who are unfitted by character and educational qualities, as no amount of scholastic training can make up the lack of natural abilities. The present college degree should not permit a man to practice general surgery. Service under a competent surgeon for at least three years ought to be the minimum requirement. Success in the surgical profession should not be measured altogether by the number of operations one does or the amount of income. If a surgeon has business ability, he has a right to exercise it in his profession. The notorious quack who has a large following and a big income has business ability, but nothing else. Our own lapses are

responsible for so much quackery. Christian science and the other fads would be little heard of if the profession had not wandered so far away from its ideals. What our profession needs more than anything else, is to be aroused from its present indifference to the existing evils. We need vigorous men of the type of Roosevelt to wake us up and infuse a healthy spirit into the life of this profession.

Let us freely admit our shortcomings and with a united fellowship—a fellowship not of knaves or fools, but of strong men—grapple with and destroy the cankerous pest that has infected our ranks. Let the glorious triumphs of this noble profession be the signal of the dawn. We still have greater achievements to accomplish. In our ranks shall be found men of the highest type of character, patiently and quietly solving the problems of human life. If a man lives up to the best that is in him, even though he does not become so widely known, he may still serve a more useful purpose than the one better known.

In closing, I like to recall from that beautiful piece of literature, "The Bonnie Briar Bush," the story of the good old doctor, MacLure of Drumtouchty, a noble type of the old school, who for forty years "did his best for the need of every man, woman, and child, year in, year out, in the snow and in the heat, in the dark and in the light, without rest and without holiday, for forty years." And when the good old doctor sent for the famous surgeon, Sir George, an ideal type of the new school, "it seemed as if the East had come to meet the West when these two stood together." After they have braved the floods of a highland river to reach the patient whom the surgeon's skill saves, Sir George, in parting, is heard to exclaim: "Give's another shake of your hand, MacLure; I'm proud to have met you; you are an honor to our profession."

DR. ARCHIBALD MACLAREN (St. Paul, Minn.): I want to congratulate Dr. Rochford on his excellent and timely paper. I want to agree most heartily in all that Dr. Rochford has said regarding the debasing influence upon the profession of the division of fees. I do not believe, however, that the division of fees is as common now as it used to be. It is certainly not in my own experience. It seems to me, the country physician who gives his time and takes the trouble to leave his practice to bring a patient to a surgeon should be recompensed, but that recompense should be shown on the account. If it is above board, if everyone knows about it, there will be no offense. If it is underhand, and the patient knows nothing about it, it is the worst kind of graft.

The essayist is entirely correct about the surgery of malignant disease. Any operation which is not going to benefit a patient, ought to be discouraged, and I think the best and strongest friends I have are patients and their friends whom I have advised against having any operation in hopeless malignancy. The patient is often not willing to take such advice, and she or he, as the case may be, insists on someone doing an exploratory operation. When it is found that no good has been accomplished by such an operation, after you have advised against it, they will remember your advice, then they are your friends, stronger than ever.

DR. J. W. ANDREWS (Mankato, Minn.): I agree with the writer of the paper that one of the greatest evils that exists in the medical profession today is that of the division of fees; and the next greatest evil is the tendency for men to operate upon patients who should not be operated on. Both of these evils are doing a great deal of injury to the medical profession. I have wondered if the division of fees obtains among surgeons in other parts of the country as it does in Southern Minnesota. Now, gentlemen, it is a lamentable fact that this evil does exist, and it exists to a very great extent.

In our State Medical Association a few months ago I introduced a fairly strong resolution into the House of Delegates condemning the division of fees, this commercialism, and I thought it would receive some discussion, but it did not. I then made a motion, asking that it be made a special order for the next day, but the president of the Association said, "There is no need of it, because no one disagrees with you." The resolution was passed unanimously right there and then.

I am certain, however, that there were men in that House of Delegates who would again divide fees. What is to be done on the part of the profession to stop this commercial evil, which is doing more to throttle the honor of the medical profession than any other that exists?

Dr. James E. Moore (Minneapolis, Minn.): I am especially interested in this paper, and I congratulate Dr. Rochford on it in the abstract, as well as on the propriety of bringing the subject before the Association at this time. I feel proud of the fact that Dr. Rochford spent the first four years of his professional life under me.

Recently I read the President's Address before the Academy of Medicine here in Minneapolis, covering this ground, and it was immediately accepted for publication in the Journal of the American Medical Association; but about a week later I received a letter from the editor, Dr. Simmons, wanting me to tone down the article a little before it was published. Not infrequently we say things that are true in a very harsh way, that are more effective when toned down. His reason for wanting me to tone the article down was that the lay journals, the daily papers, and the magazines are constantly on the look-out to trip us up, and they are watching the Journal, the representative organ of the profession, from week to week, to see what it contains, and he was afraid to say things as hard as I said them lest they picked out certain sentences and made use of them.

We all know that these evils exist in the profession, and it behooves us to stamp them with our disapproval, otherwise we shall be censured as a whole. Heretofore we have been quiet about this matter because we did not want to say, "I am holier than thou," because we all make mistakes at times. We all err in judgment. We all do bad work now and then. We are all human beings. Now is the time for the profession to acknowledge that we have these evils among us and to denounce them, to point them out, to acknowledge the fact that we have disreputable men in the profession who are cutting a wide swath, and it is time to point them out, denounce them, and let the press take advantage of that, otherwise the lay press will do just as was done here not long ago when an influential commercial paper in this city published a most scurrilous article under the title "Appendicitis Graft," written by an ignorant layman unfamiliar with the facts he was trying to write about and to instruct the public about, and he denounced the whole medical profession as a

bunch of grafters. This is the day of radicalism and we have radicals in every community and what makes them possible is that by virtue of the wonderful technic we have developed, we can invade every cavity of the human body without necessarily killing the patient, and these radicals take advantage of this situation, and just as soon as they are able to open the abdomen without killing the patient, they begin operating. and the crimes that are being committed by them in every community in the name of surgery are simply appalling.

DIAGNOSIS AND TREATMENT OF CANCER OF THE UTERUS

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Is cancer on the increase? is a question often asked. The answer to this question has called forth this brief paper. In answering it I have confined myself to the statistics of the State of Minnesota, for which I am indebted to Dr. Bracken, Secretary of the State Board of Health, who informs me that while the statistics are approximately correct, they are not absolutely so. Evidently, all forms of malignant tumors have been classed under one head, cancer.

I have taken two periods at random as illustrating the increase of the disease, from 1894 to 1897, inclusive, and from 1904 to 1906, inclusive. In 1894 there were 404 deaths reported from cancer. In 1895. 476; in 1896, 514, and in 1897, 514, showing in this period of four years a little over 27 per cent increase in deaths from cancer. Now, skipping to 1904. In that year there were 776 deaths from cancer reported. In 1905 there were 809 deaths reported, and in the first eleven months of 1906 there were 715. If to that number we add 65, the average monthly deaths for the eleven months, we have for the year 780 deaths, which is 29 less than for the year 1905, but four more than that of 1904.

I find in reviewing the statistics that there is no

regularity with regard to the months of the year. In some years the summer months show the largest death-rate, and in other years the winter months. In the seven years from 1897 to 1904, deaths from cancer increased more than 50 per cent, and in the eight years from 1897 to 1905, inclusive, it has increased over 57 per cent. During these same eight years the population of the state has increased about 21 per cent, showing that the increase of population does not explain the increase in the cancer death-rate. In recent years the thing we have learned about the disease which is of more importance than anything else, is that it is not an absolutely hopeless condition if recognized early and treated properly. This knowledge has hardly as yet become well enough disseminated to make much difference in results. The etiology of the disease is still obscure. The autonomy of cells is probably the most plausible theory advanced, but the invisible, intangible, elusive, magical force which converts a cell of innocence and usefulness to the economy into one so dangerous and destructive has not as yet been revealed. We know, however, that age, trauma, tumors, etc., play an important part in the causation of cancer. In dealing with cancer of the uterus we meet with the difficulty that so many women believe that the danger signals are only the natural results of their age. When women learn that change of life is a natural, physiological process, and should not be accompanied by torrents of blood and profuse discharges, then we may hope to see these cases of cancer early enough to do them some good. When the general practitioner shall learn to make a careful examination of women complaining of flowing spells at the cancer age, and not send her home with a bottle of medicine and the statement that it is only change of life, then many lives will be prolonged, if not saved. My own ex-

perience for the past year well illustrates the fact that the diease is not recognized early. I saw six cases of cancer of the uterus; in only one of the six cases was the patient seen early enough that treatment would do her any good. One of these cases, however, had had a hysterectomy done and the growth recurred in about two months, showing that the disease must have been far advanced when the operation was performed.

Two forms of cancer make their appearance in the uterus—adenocarcinoma of the body of the uterus and squamous-cell carcinoma of the cervix. In neither of these are there any diagnostic symptoms. Two symptoms, however, are so constantly present, hemorrhage and discharge, that every woman at the cancer age should be taught their significance. I believe it good teaching that these symptoms should be looked upon as indications of cancer of the uterus until the reverse is proven. Any practitioner who is unable to satisfactorily exclude cancer when these symptoms are present, is derelict in duty if he does not at once ask the advice of a more experienced man. Women, as well as some medical men, must be taught that pain is not an early symptom of cancer. The terrible suffering they have heard or known of in women dying of cancer has convinced them that without pain there can be no cancer. Offensive discharge, pain, urinary symptoms, and rectal symptoms are only present in advanced cases of cancer of the uterus. In such any physician who has ever seen an advanced case of cancer of the uterus ought not have any difficulty in making the diagnosis, and if he did fail it would not be so important, because the time is then past for treatment to be any more than palliative.

The diagnosis of the early stages of cancer of the uterus is that which is so important to the woman. A woman between the ages of forty and fifty has a

profuse flowing spell at her menstrual period, or she has noted a bloody discharge after intercourse, or on straining at stool, or on the use of the douche, and, besides this, she notices that she has a discharge from the vagina a little more watery than an ordinary leucorrhea and probably more irritating. On account of this, if she has had the proper instruction, she will consult her physician. If he is a capable man he will not tell her this is change of life, but at once endeavor to find out the nature of the trouble. If it is a commencing cancer of the cervix, which is the most common form of cancer of the uterus, on digital examination he will find the cervix somewhat enlarged with a feeling of hardness and roughness to the surface, which manipulation causes to bleed. He may also find evidences of laceration of the cervix. The enlargement will be found most commonly in the anterior or posterior lip of the uterus. Usually, even quite early in the disease, the cancer tissue will be friable, so that it may be broken down with the finger, when it will bleed profusely. When this can be done the diagnosis is almost certainly cancer, but if the doctor is still in doubt, he should have a microscopic examination made of a broken-off piece, or should cut off a piece for microscopic examination by a competent pathologist. If the condition is an adenocarcinoma of the body of the uterus the diagnosis is more difficult. The symptoms, hemorrhage and discharge, will be present, but on physical examination the cervix may be found almost normal, and about the only thing revealed will probably be a slight enlargement of the uterus. If a sound is passed into the uterus it will cause bleeding. The only way in which a positive diagnosis can be made is to have the uterus curetted and a microscopic examination of the scrapings made. The treatment is surgical as nothing else has proven of any advantage. There

are three surgical procedures, which are practiced. The first, an abdominal hysterectomy, doing the radical operation advised by Ries of Chicago and others, removing the uterus, upper part of the vagina, broad ligaments and dissecting out the iliac glands. This has never appealed to me, because the immediate mortality is so high that if occasionally we prolonged the life of a patient the lives of many others were cut short by it. So that in years added to the lives of patients we are losers rather than gainers. As to a hysterectomy without the extensive dissection advised by Ries: This may be done either by the abdominal route or the vaginal. I am partial to the latter because a patient usually rallies and gets well more rapidly after a vaginal hysterectomy than after abdominal, and I am satisfied that with an ordinarily roomy vagina, the uterus, ovaries and tubes can be removed as completely as through the abdomen. I also believe that if the electric clamp is used, as advised by Downes of Philadelphia, and the stump of the broad ligaments cooked that the gain to the patient is considerable. The treatment advocated and followed by Byrne for 20 years has not been given the attention it deserves. He operated on 367 cases of cancer of the uterus, of these 140 cases were carcinoma of the cervix, and 219 of both cervix and body of the uterus; 8 only were confined to the corpus. His results are, probably, almost equal to those of any line of treatment at the present time. 151 cases were lost sight of in the first year. There were 216 cases of which the subsequent history is known. Of these, 19 remained free from the disease from 10 to 18 years, 22 for five years or more, and 93 for two years or more. Thus it is seen that 19 per cent of his cases were free from the disease for five years, or more than 43 per cent for two years, or more. He also has shown that when recurrence took place it would take place in

the body of the uterus or adnexa, but never in the stump of the cauterized part. Another important feature is that of his 367 cases no one died as a result of the operation. I think, beyond doubt the good results obtained by Byrne were due to the thoroughness with which he did his work. The only advantage that I can see in the electric cautery over other forms of cautery is the fact that the heat of the cautery can be better controlled, and that the cautery knife and other forms of cautery can be better shaped for manipulation through the vagina. I have never used the electric cautery, but have used other forms of the actual cautery, usually, however, in cases I considered too far advanced for other forms of operative procedure, and I have never used it with the thoroughness Byrne advises, and yet I have been gratified to see how much some of these cases have been benefited. As I have been asked to limit my paper to ten minutes I cannot enter into a discussion of Byrne's technic. I want, however, to mention the modification of the Byrne method advocated by Dr. X. O. Werder; that is, the doing of a vaginal hysterectomy using the Dr. Downes electric clamps and cooking the stump of the broad ligament and cauterizing the raw surfaces with the electric cautery. If the cautery is of advantage as Byrne and others have demonstrated then I believe this method is in advance of any for removing the cancerous uterus.

FOR DISCUSSION, SEE PAGE 361

THE CANCER QUESTION, WITH SPECIAL REFERENCE TO THE TREATMENT OF CANCER OF THE BREAST

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The world-wide crusade urged in the education of people as to the cause, prevention, and treatment of tuberculosis, is bearing fruit, and pursued to its legitimate end may result in the wiping out of tuberculosis as the "white plague."

The education of the public regarding the meaning of certain conditions that point towards beginning cancer, and the importance of early expert examination, has been woefully neglected, and it is well-nigh impossible for the medical profession, unaided, to accomplish this. We need the coöperation of an honest public press. In fact, only within the present month has the layman had the subject of cancer presented to him in its true light as we know it to-day; and the world at large owes a debt of gratitude to the Saturday Evening Post for its educational campaign in this direction and others, looking towards the protection of the public in matters of hygiene, the cause and prevention of disease.

Charles P. Childe ("The Control of a Scourge; or, How Cancer Is Curable) has just published a most readable and instructive book intended for the public, which I hope will have wide recognition. In this book

Mr. Childe tells, in plain, simple language, what we know about cancer and the great advance made in its cure by early operation. It is the best book of the kind that has ever fallen under my recognition, and will undoubtedly result in the saving of many lives.

Many physicians living to-day can recall the former ravages of typhus fever, malaria, cholera, dysentery, yellow fever, diphtheria, and other zymotic diseases; they have noted the waning of tuberculosis. The public knows all of this and has legislated accordingly. Has the physician tried to educate the public to the increasing prevalence of cancer? We, as physicians, know some facts, although our interpretation of their exact meaning may differ. Some believe cancer is hereditary or that man inherits a weakened resistance towards the development of cancer, just as he inherits a constitution and physical make-up favorable to the infection and growth of the tubercle bacillus. We escape from, and overcome, the diseases of childhood in proportion as we spring from good parent stock, physically and mentally, and our guardians exercise the known measures against such as are preventable. We reach middle life in direct proportion as we take care of our inheritance, and keep in touch with the educational progress of our times. Vital statistics show that although a much greater percentage of the population reach middle life than formerly, fewer people reach old age, i. e., "the saving of life in modern times has mainly been confined to the pre-cancerous years of existence, the death-rate of males over thirty-five and of females over forty-five having remained almost stationary, while the numbers attaining old age have decreased" (Williams). The increase in the death-rate from cancer can, only in small measure, be accounted for by increased skill in diagnosis and more accurate statistics. In England while the population barely doubled (1850-1905) the cancer mortality increased more than six-fold (Williams), and all reliable vital

statistics go to prove that this increase in cancer mortality is universal. In England the Registrar General's report shows that in 1906, out of a total of 141,241 deaths of males over thirty-five years of age, 12,695 died from cancer; and out of a total of 140,607 deaths of females over thirty-five years of age, 17,671 died from cancer. This means that one man in eleven over thirty-five years of age will die of cancer, and that one women in eight over thirty-five years of age will die of cancer. In England the cancer death-rates for 1905 are, per 100,000 living, 75.6 for males and 100.5 for females; the corresponding phthisis rates being, for males 134.7 and for females 95.7. The meaning is that more women die of cancer than of tuberculosis.

In Nebraska, a population of young people, tuberculosis is very prevalent, yet even there cancer claims its many victims. The total deaths in Nebraska from tuberculosis in 1907 were 589: men 303, women 286. Total deaths from cancer (1907) 355: men 166, women 189. Here in a new community representing the survival of the fittest from older states, more than half as many women die of cancer as of tuberculosis. Aside from what may be one's personal belief as to the cause of cancer, he should be modest in asserting it when so many brilliant workers are at sea notwithstanding their unusual opportunities for investigation. Dr. Bashford, General Superintendent of Research and Director of the Laboratory of the Imperial Cancer Research Fund, says (The Lancet, November 21, 1908): "The successful application of the comparative and experimental methods appears to be greatly narrowing the field of inquiry and dismissing many explanations of cancer, previously held with good reason, from further serious consideration. Although this is the case, we still know very little as to its etiology beyond the fact that it manifests itself under the most divergent conditions and in such a way that we may have to entertain the possibility of several etiological factors,

some of which are external and some internal to the body. To these factors we are justified at present in assigning only an indirect and mediate etiological significance. The most satisfactory explanation of the causation of cancer will probably be that implied by the accurate description of the nature of the transformation of normal into cancer cells when this advancement in knowledge shall have been attained." This sentiment is in line with the deductions of Roger Williams as stated in his most remarkable book on "The Natural History of Cancer."

Williams demonstrates the overwhelming evidence of the heredity of cancer and the increase of the disease, but he believes that heredity for cancer means a lessened resistance to the cause. The increase can best be explained by modes of modern life and excess in proteid diet. He almost ridicules the parasitic theory and explains away the "cancer districts," "cancer homes," etc., as incidental. In striking contrast to this, Roswell Park, in a recent address before the International Society of Surgery, opening the Symposium on Cancer, comes out boldly for the parasitic origin of cancer, and in a fascinating and convincing way, he pleads for the throwing-off of the shackles of the dead-house pathology and the blind following of so-called "leaders." Park thinks the evidence of clinical observation and experimental research, added to the analogy that cancer bears to known zymotic disease, admits of no other reasonable explanation than that it is of parasitic origin. I am more and more inclined every year as my clinical experience grows, to look upon cancer as zymotic in origin. In my judgment evidence of its infection by direct contact is lacking,—it may be auto-inoculable. I believe the germ or its poison to be conveyed through the medium of a host in the same way as yellow fever is carried. "Cancer districts" exist. This is known. What other explanation than infection through some intermediate means can explain the fact?

It is the only explanation in line with what we really know about infectious diseases. There is probably, I think, some relation between tuberculosis and cancer. As tuberculosis decreases cancer increases. Cancer is prevalant in tuberculous families and prefers to select for its victims those members of the family who have survived, unscathed, the tuberculous age.

During the past two or three years I have been more than commonly impressed by the number of cases of advanced cancer of the uterus and breast that have come to me for relief. Some of these cases were clearly inoperable, and others almost so. On the other hand, with the exceptions of cancer of the mouth, throat, larynx, and esophagus, I have seen few cases of late cancer, I mean neglected cancer, on the surfaces of the head, face, neck, and body. Particularly must it be emphasized that now-a-days, more seldom than formerly, we meet with unrecognized malignant diseases of the abdominal viscera. This is due to the phenomenal spreading of the knowledge of diagnosis in all abdominal affections. When we stop to recall that eighty per cent of all tumors of the breast are malignant, and that every malignant tumor, unless removed, sooner or later kills, the great responsibility of the family physician, when his advice is sought, is apparent. Unfortunately, human nature is still as of yore, and education is slow in making proper progress. Fads and fancies, religious and otherwise, vain hopes, and graspings after straws, influence too many to put off an operation. The instinct of woman to conceal the existence of a tumor, for fear it may be pronounced cancer, can alone be overcome by the medical profession spreading abroad the truth that eighty per cent of all tumors of the breast *are* cancer or become so, but that the operative mortality in experienced hands is only one-half of one per cent.

Rodman has collected 2,133 operations performed for cancer of the breast since 1893 by twenty-one American surgeons, with an operative mortality of less than one per cent. As to the hope of cure, Bloodgood (American Journal of the Medical Sciences, February, 1908) says: "The statistics in Halsted's clinic up to the present time, show that among 210 cases in which three years or more have passed since the operation, 42 per cent are apparently well. If we consider the cases in which the axillary glands, studied miscroscopically, showed no evidence of metastasis, sixty-one cases, or eighty-five per cent, are well. In cases in which the axillary glands showed metastasis (110), thirty per cent remained free from recurrence for three years. When the glands in the neck showed metastasis (40 cases), only ten per cent remained well for three years. In all of these groups metastasis has been observed after an interval of three years of apparent cure. Such late metastasis may take place up to eight years after operation. Excluding these cases of late recurrence, the definitely cured in these three groups is reduced to 75, 24, and 7 per cent, respectively, or, for all cases together, to 35 per cent." To this clinic 464 cases of primary carcinoma of the breast have been admitted. *In* 115 (27.5 *per cent*) *the disease has been inoperable.*

In a most important series of papers read at the 1907 meeting of the American Surgical Association, the subject of the end-results of primary operations for cancer of the breast was the chief topic discussed. There was practically no difference in the results at the hands of these men, all representatives of the best of surgical judgment and skill in America.

I have taken Halsted's statistics as an example because we are much indebted to him for the principles of the type of operation which is producing the best results in the operative treatment of cancer of the breast. In addition, it can be stated that in no clinic in the world are more pains taken to secure accuracy in all

that pertains to scientific, honest work and reports than at the Johns Hopkins Hospital.

Most cases of cancer of the breast can be recognized by every physician of experience or proper education. Because a tumor may have existed quiescent for months, or perhaps years, is no proof that it may not be malignant. Jacobson (Annals of Surgery, July, 1907) puts it very nicely when he says "It is not always possible to determine the period of duration of the disease. Inasmuch as in its early stages carcinoma is entirely devoid of pain, it is frequently a matter of accident that the tumor is discovered . . ." "The rapidity with which the disease progresses is of paramount importance. I think it will be conceded without dispute, that there is as much difference in the virulence of the cases of carcinoma as there is in acute infectious fevers. In some instances of the latter, the fever will progress so mildly as to scarcely disturb the patient, while in other instances it will overwhelm the individual with such fury as to be fatal within twenty-four hours."

Cases of the acute type are most unfavorable for operation. Their only hope is in early recognition and immediate operation. Questionable cases may be submitted to exploratory incisions. The surgeon should be better equipped to recognize the gross pathology presented. Frozen sections require only a few minutes to determine the probable character of a tumor; therefore in some hospitals a specimen is removed at an exploratory incision, and frozen sections examined in order to determine the true nature of a doubtful tumor. This practice is not always available, but in well-equipped hospitals it should be. When I am in doubt as to the nature of a tumor after exploration and careful inspection, I do the radical operation and have the pathologist submit his report at his leisure. This practice I have never had to regret; in fact, I would rather trust my surgical sense after a careful clinical history and ex-

amination, with an added gross inspection of a tumor on incision, than the microscopical findings of any pathologist. One would be a fool to belittle the value of the microscope; however, from the same standpoint, my family physician must be the man who, in a case of strongly suspected diphtheria, gives a large dose of antitoxin, and then takes a culture and awaits the bacteriological report with a smile.

In spite of the lack of *positive* confirmation, by Wile and others, of the work of Crile, in his study of hemolysis in cancer, I feel confident that Crile, a known, keen clinician, a physiologist and original thinker, is in a better position to scientifically study cancer in man than his co-laborers, the bacteriologists. His technic under such circumstances cannot help but be followed by more uniform results; hence when he tells of the 85 per cent positive hemolysis in his cancer cases, (130 out of 153), that "the cancer cases showing no hemolysis were mostly in the advanced inoperable stage"—only an occasional early case failed to show hemolysis—we must recognize that a great stride has been made towards the early diagnosis of cancer. It is to be hoped that a reliable, simple technic may be worked out as a blood-test for cancer, one which will place this aid to diagnosis where it can be more universally applied than would at present appear.

As in cancer early operation offers the very best and reasonable hope of cure, we should do our duty in every legitimate way to educate the public to the fact. That they are not so educated is evidenced by the thrivings of charlatans and the proprietors of the public press. (W. D. Haggard, Journal of the American Medical Association.) As Rodman says: "It is more important to make an early diagnosis in cancer of the breast than it is in appendicitis. Some of these patients may, and do, get well without operation, whereas neglected operation in breast-cancer leads inevitably to the most loathsome and horrible of deaths. Wom-

en with lumps in their breasts do not understand their danger. They are afraid of operation on account of ignorance of its safety and the great probability of permanent cure in the early stages, because of an unfavorable result in some friend who was probably operated on in an advanced stage."

At least twenty per cent of the cases of cancer of the breast in advanced stages that have come to me for operation, have suffered the delay because of the advice of their physicians, and it is hard to put out a charitable explanation upon such advice. Of course there are frequent instances when patients will not follow the family physician's advice until it is too late, and of such examples I have had many instances. Particularly among the relatively young sufferers from cancer should we be over-zealous in urging early operation—the soil is fertile. Among the older or advanced in years the principle of recommendation is the same, yet, in truth, in them cancer often has long periods of quiescence. In the presence of feebleness or the complications of age, palliative operations only are admissible, and in some instances any operation would tend to bring surgery into disrepute. I will recall an instance of an old lady whose breast I amputated (radical operation). It was as the result of heroic efforts that she survived the operation. An unexpected weak heart only needed the shock of the operatiton to almost cause it to cease to beat. Suddenly, about two months after the operation, the poor tired heart stopped. A more careful observation prior to operation ought to have discovered the weak heart, and I have always believed that my operation was ill-advised. So let us use good judgment in the treatment of cancer, as in all of our professional duties.

Since I have been doing operative surgery, I know of no surgical disease the treatment of which has advanced so much in the saving of life as that of cancer of the breast. As every case of cancer of the breast

inevitably dies of the disease unless operated upon properly, an ability upon the part of the operator to do thorough radical work is essential. A knowledge of the usual and unusual distribution of the lymphatics must precede the path of the scalpel and scissors. As Mr. Lockwood so well says, "The rapidity with which cancer spreads into the lymphatics depends to a large extent upon the position of the primary growth. When that is situated within a hollow muscular organ, such as the urinary bladder, or gall-bladder, the pause may be a long one,—months or even years. But when the growth is in the mammary gland, which has no capsule, or the tongue, or in the pharynx, there is, I believe, hardly any interval of time between the onset of the growth and its spread into the neighboring lymphatics."

The first amputation of the breast I ever witnessed was in the fall of 1879 in Belview Hospital, New York City, and the operator was James R. Wood, a most skillful man in operative technic. The breast, with an elliptical covering of skin, was removed. The axilla was not disturbed. The technic did not vary much from that told of by John Brown in his pathetic story of "Rab and His Friends," when poor Ailie bared her breast and had it removed. Banks, in England, and the younger Gross and Halsted in America, taught us the principles of thorough radical operation. An increasing knowledge of the distribution of the lymphatics has added greatly to our end-results.

The many men who have of late tried to give their names to special operations for cancer of the breast, are simply artists in cosmetics,—and some are good ones too. They are paraphrasers of the writings of Banks, Gross, Halsted, and their students, and their work is useful to that extent. The men who have the best results in the treatment of cancer are not those who think so much about how the wound will look after operation, but, rather, how they can get beyond

the possible extent of the disease,—the man who does this finds some way to close the wound. Cancer of the breast in men is rare,—I have seen only three cases, two of which I operated upon. About one per cent of the cases of cancer of the breast occur in men. In the Johns Hopkins Hospital, out of 307 cases of cancer of the breast only three affected the male breast. Age is no protection against carcinoma of the breast. One case, a girl (mulatto), sixteen years of age, was operated upon by me in the Douglas County Hospital, and Dr. Lavender pronounced the tumor a typical adenocarcinoma. This is the youngest case of my experience. I have among my patients one alive and well who was operated upon twenty years ago. A patient sent by Dr. White of Bassett, Neb., died of cancer of the liver nineteen years after I had removed her breast for cancer—a possible late metastasis. I have a few others living many years since the date of the operation, but among a large number operated upon since the modern operation was well understood, not less than 50 per cent have been cured, and the percentage of cured is increasing. Among my cases are two of amputation of both breasts. One case is extremely important. A surgeon had removed a neoplasm from the breast. Some months later when I saw the woman a recurrence had taken place. The breast was adherent to the chest-wall, and the axillary glands were much involved. A thorough operation, including the removal of parts of two ribs, was carried out. To-day, eleven years later, the woman is well. Certainly such a result is a credit to surgery, and should make one hopeful. However, I must confess that only occasionally have I had permanent recovery follow operations in advanced cancer, wherever situated. Usually such operations are only palliative. Fortunately, many of these operated sufferers die of internal metastasis.

Another question of importance is the presence of a cancer in the breast of a pregnant or suckling woman.

My own experience is that three propositions may be presented for decision; (1) cancer recognized developing in the breast of a pregnant woman during the early months of pregnancy; (2) cancer developing in the breast during the later months of pregnancy; (3) cancer developing in the breast during the early active period of lactation. It is known that pregnancy and lactation affect a cancerous breast like high wind does the prairie fire.

Little advice as to how to act is found in our American text-books. There is *the* only remedy, the knife; but *when* should it be applied? In the early period of pregnancy the sooner the better. In the later period, should delay be permitted until after delivery? Experience has shown that it is hard to do an operation at this time sufficiently radical to prevent a rapid recurrence. There are said to be special dangers to the mother, and the mortality is high. In the interests of the child, would delay until after confinement be preferable? In spite of the gloomy forebodings of some English surgeons, my experience teaches me that if the case is an operable one *aside* from the complication of pregnancy, the most radical operation practicable should be carried out.

A liberal dose of morphine and hyoscine should precede the anesthetic, chloroform by preference. Special pains should be taken to guard the patient from shock by protecting the surfaces of the body and wound from cold and too rapid evaporation. Pressure upon the abdomen should be avoided. Hemostasis should be accurate as the operation proceeds. A poky operator should turn a case of this kind over to a more rapid colleague. The morphine and hyoscine lessen the amount of the anesthetic required, and are followed by greater repose, thus diminishing the dangers of exciting premature labor. I have had some happy experiences following this practice. When cancer develops in a suckling woman the baby should be weaned

immediately. In the doing of this the breast should *not be massaged*. The breast-pump should be used with great gentleness and not too often. Nothing should be done to stimulate the flow of cancer cells (germs) from the tumor into the lymphatics and veins. Camphor and belladonna given internally and moist cold locally, with the breast gently and equally supported, will bring about a rapid cessation of the function of lactation and diminution in the general fullness of the breast. Then the operation may be carried out with a fair prognosis.

After every breast amputation I feel confident that the *x*-ray may be used to advantage. The worse the case, particularly the greater the skin involvement, the more valuable the *x*-ray.

Haldane's explanation of the spread of infection of breast cancer is a valuable consideration along this line.

DISCUSSION OF THE TWO PRECEDING PAPERS

DR. W. D. HAINES, of Cincinnati, Ohio, was asked to open the discussion on these papers. He said: These are two especially interesting papers. In trying to follow some of the able work that has been done with reference to the early recognition of malignancy, one article which attracted my attention was by Weir, of New York, and I hope something good will come out of this work. We place some confidence in the following phenomena as guides to the early recognition of cancer. First, a permanent diminution in the percentage of hemoglobin; second, the absence of the postprandial leucocytosis. These two features have been fairly constant in our examinations along this line. Of course, the early diagnosis of cancer is the key to the situation of success in treatment. Table diagnosis in any instance of tumor of the breast, no matter how small—the smaller the better—is the one that should appeal to us. But, like the essayist, I cannot altogether rely on laboratory diagnoses. I am old-fashioned and like to stick to the clinical features of the case.

I had an instance quite recently where the pathologist told me in the course of five minutes that the section he had examined looked suspicious, but that he could not say the

tumor was malignant from the section. I removed the breast, in spite of this report, and in removing the glands I found some enlarged glands back of the pectoral muscles well up to the point where they anastomose on the right side with the deep cervical glands. There were three nodes in this locality not larger than the ordinary navy bean, and malignant degeneration was present in all three of them. Our plea, of course, should be for the education of the public to look upon all of these tumors as malignant; that all scar-tissue is liable to undergo degenerative or malignant changes, as I tried to show in my paper in speaking of chronic ulcer of the stomach. We know, if we know anything, that a raw surface *plus* irritation continued for a period of time, means malignancy, whether you accept the cell-autonomy theory or the parasitic theory of the origin of cancer. We look upon lymphatic involvement and tumor in malignancy very much as we look upon pus and rupture in appendicitis.

In operating we should always remove the gland-bearing tissue, and in this way prevent more trouble, as by so doing we shall best conserve our interests and particularly those of the patient.

Dr. Edward S. Judd (Rochester, Minn.): Dr. Barton and Dr. Summers have brought out the point that our ability to treat cancer depends very largely on early diagnosis. That may not be so true of cancer of the uterus as it is of cancer of the breast. For this latter condition we should operate early. Dr. Summers has shown that nearly one in four cases of cancer of the breast can be cured where the lymphatic glands have been involved, while if we can get the cases before the axillary glands are involved, we shall be able to cure approximately three out of four.

A tumor in a woman's breast should be regarded as a surgical disease and removed at once. In young women, supposedly benign tumors, perhaps, will turn out to be malignant. Dr. Summers has said that he would not rely upon a pathological examination to determine the nature of the tumor. I think that this would be true in a number of cases. There are a great many cases of tumor of the breast where one can be positive about their true nature from a gross examination. On the other hand, there are many tumors removed from the breast that we do not feel sure about, but whose true nature can be determined by a competent pathologist.

DR. ARCHIBALD MACLAREN (St. Paul, Minn.): Dr. Summers' observation about pregnant women is a timely one. I do not believe that an operation for the removal of cancer from the breast is likely to produce miscarriage, because I can recall quite a number of operations which I have done upon the uterus in the presence of pregnancy without the occurrence of abortion. As I remember it, I have the histories of ten cases in which myomectomy was done in the presence of pregnancy, abortion followed only in one instance.

DR. JOHN L. ROTHROCK (St, Paul, Minn.): Dr. Barton has brought up a question which interested me very much, and I would like to ask him whether he noted the number of cases of cancer of the uterus. At one time I had occasion to look over the statistics of the Health Department of St. Paul from 1890 to 1900 to find out the relative proportion of cases of cancer of the uterus to cancer in general, and I found, to my great astonishment, there were only twelve per cent of cases of cancer of the uterus, which seemed to me a much lower proportion than I had anticipated because most writers have told us that cancer of the uterus is quite frequent, or that the uterus is an organ most frequently involved, some writers putting the breast first, and others putting the uterus first. Whether we have less cancer of the uterus in St. Paul than in other centers, I am not prepared to state. It is an interesting question as to whether these ten years show a smaller proportion of cases than usual.

With regard to the question of diagnosis: With the rapid diagnosis by microscopic sections I have had considerable experience, as I began fifteen years ago to make these examinations for a number of operators in St. Paul, and my experience has been this, that in a certain percentage of cases, the cases we wish to know about, the most uncertain ones, microscopic examination of the rapidly fixed and stained specimen does not always afford satisfactory data, because we must often make examinations of quite a number of sections, and time for that is not allowed. There are many cases where the surgeon, if skilled in gross pathology, ought to be able to make a diagnosis after incising the tumor. While the rapid preparation and examination of sections are an aid to diagnosis, still there are some cases which will require the examination of a number of sections before an accurate diagnosis can be made.

With regard to cancer of the uterus: The unfortunate feature in reference to early diagnosis is absence of symp-

toms, and it is only by educating the laity we can arrive at better results than we now get, because most of these cases by the time they give symptoms at all are too far advanced for an operation.

Dr. Barton (closing the discussion): In answer to Dr. Rothrock's query about the number of cases of cancer of the uterus: They are not tabulated in the records, and I was disappointed in not being able to get them in that way. The cases are reported simply as deaths from cancer. I do not know what the proportion is of cancer of the uterus as compared with other forms of cancer.

EXTRA-UTERINE PREGNANCY, WITH REPORT OF A CASE WITH THE DELIVERY OF A VIABLE CHILD

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Extra-uterine pregnancy is quite frequently met with. There is abundant literature covering the history and treatment of such cases. Only those completing the term of pregnancy will be discussed in this paper. It is possible for a case of tubal pregnancy to abort or suffer rupture of the tube without separation of the placenta with continuance of the gestation. This is rare, but it is rarer to have the patient delivered of a viable child at or near the completion of the term of pregnancy. While the ectopic fetus is placed in dangerous surroundings a sufficient number of cases have been reported where the fetus has attained a viable age, that they are not extremely rare. Kelly reports seventy-seven cases collected from 1809 to 1899, which he divides into two groups: one from 1809 to 1889; thirty-seven cases with seven recoveries, or 18.9 per cent, and a maternal mortality of 75.6 per cent; the second group from 1889 to 1899, containing forty cases, with twenty-seven recoveries, or 67.5 per cent, and a maternal mortality of 32.5 per cent, which is an improvement of 50 per cent in the mortality-rate under improved technic and asepsis.

Sittern has recently reported 147 cases in which a

viable fetus has been delivered by means of operation. Dr. Werder reports three cases with one death. Drs. Blesh and Reed report a case, both mother and child living several months after operation. The child mortality is very high. In the first group reported by Kelley it was 82.9 per cent; in the second group, 75 per cent. There are many reasons to account for the large death-rate. The child is apt to be ill developed and badly nourished, hence it succumbs to slight causes. Sittern states that more than half of the children survive the first month. He advises operation some weeks prior to the completion of the term on account of spurious labor causing death of the child.

Werder states that it is better to wait till completion of the term because the children are weak and the death-rate will be increased by premature operation. I am of the opinion that Dr. Werder's advice should be adopted.

The following case is believed to be of sufficient interest to be worthy of record: Mrs. W., aged 34; married at 20; first child born seven years after marriage; labor normal. Not again pregnant until the present pregnancy. Last menstruation September 23, 1907. On September 15th she had an attack of pain in the right iliac region lasting several days. About every two weeks she had attacks of pain in the right side. From November 12th to 26th she was in bed on account of this pain in her right side.

On December 1st she had a very severe attack of pain in the lower abdomen, more marked on the right side. Was confined to her bed until Feb. 15, 1908. Diagnosis: appendicitis.

It is probable that she suffered a rupture of the tube at this time. From the latter date she was in fair health until June 26th, when she had a spurious labor. Some watery discharge took place, followed by a bloody discharge. She had labor pains for some hours, and then they ceased.

On August 12th she had a recurrence of pain and was examined by the attending physician. On August 13th she was given an anesthetic, but no definite diagnosis was arrived at. On Aug. 14th she was brought to the Samaritan Hospital, and upon examination I found the child extra-uterine. The head presented in the pelvis back of the uterus, the body of the fetus lying in the left side of the abdominal cavity back against the parietal wall. The placental souffle could be made out upon the right side extending from the umbilicus down to Poupart's ligament. No fetal-heart sound could be made out.

The patient was anesthetized, and proper preparation made for abdominal section. An incision extending from the umbilicus down to the pubes was made. The membraneous sac presented upon the left side attached to the intestines and left side of the uterus. The right side was covered in by the omentum, much thickened and firmly adherent along the right margin of the uterus down to the pelvic brim. I commenced separating the sac, which was very thin, from the intestines and left margin of the uterus. After separating the sac for about four inches it ruptured with a discharge of some amniotic fluid, and the right arm was expelled. The child was now rapidly delivered, the cord ligated, and the child passed to Dr. A. M. Warren, who, after some time, succeeded in resuscitating the child. Notwithstanding the unfavorable surroundings of the child, no deformity was present. It weighed about seven pounds. A careful examination was made to ascertain whether it was possible to remove the sac and placenta. It was impossible to reach the arteries supplying the placenta, which was attached upon the right side extending from the pelvis upward for several inches and was attached to the uterus and omentum overlying it. During the manipulation some hemorrhage occurred, and further efforts were abandoned. A portion of the sac was separated from the intestines, and the excess removed. The cord was ligated and cut short. The sac was now sutured to the lower

part of the abdominal incision and packed with sterile gauze. Each day some hemorrhage occurred, and she began to be somewhat anemic. On the 16th day after the operation I attempted to remove the placenta, but on account of free hemorrhage I found it impossible to do so. The sac was firmly packed, and two hemostats were placed at the upper portion to completely control the hemorrhage, and were allowed to remain in place for forty-eight hours.

During the fifth week the sac and a portion of the placenta were discharged. Some days following this, infection took place attended with a free discharge of pus, the temperature ranging from 100° to 103° for ten days. With the patient profoundly anemic and now septic, it seemed almost impossible for her to recover; however, with free stimulation and feeding she began to rally. During the first week she had marked distention of the stomach, which required stomach lavage once or twice daily.

After a tedious and stormy convalescence, she left the hospital on November 5, 1908, and has steadily gained in strength and flesh. The child lived about ten hours, when it suddenly expired.

The history of these cases shows a large mortality. The frightful hemorrhage caused by efforts to remove the placenta has determined the cause. When possible to separate the adhesions and secure the ovarian artery and the branches of the uterine it may be safely removed. I am of the opinion that many cases would be saved by allowing the placenta to remain for subsequent delivery. It is true that later hemorrhage might occur threatening the life of the patient; also, we have the danger of infection. With pressure or clamping of the abdominal aorta, the hemorrhage may be controlled, but unless it is plainly possible to completely remove the placenta it had best not be resorted to, for when the pressure is removed a fatal hemorrhage will take place. When the diagnosis has been made of an abdominal

pregnancy existing it is usually after the middle of the term; hence I believe it better to wait to the completion of the term before operating. The danger to the mother will not be increased, and the possibility of the delivery of a viable child is assured. Should a diagnosis be made at the time of the rupture of the tube, it would probably be better to advise operation. Again, it is a mooted question as to whether an immediate operation should be done. In the above-recited case, it was not suspected that the pregnancy was other than normal.

This case demonstrates the possibility of delivering a viable child some time after the completion of the term and spurious labor has taken place. In this case spurious labor occurred June 26th, and the operation took place August 14th, a period of forty-nine days. It is probable that the complication of appendicitis may account for the dense adhesions existing at the location of the placental attachment. The right tube was the seat of primary implantation of the ovum.

Sittern advises complete removal of the placenta, stating that the death rate is 18.8 per cent. When the placenta is allowed to remain the mortality is 54.4 per cent. These statistics are so pronounced in favor of complete removal of the placenta that, when possible, it should be done; however, I am convinced that some lives have been lost on account of uncontrollable hemorrhage caused by persistent efforts to remove the placenta. The history of a number of cases proves that it can be safely done when properly managed. Drs. Blesh and Reed allowed their patient to leave the hospital at the end of four weeks. Four weeks following, or eight weeks from time of operation, their patient returned to the hospital, when the placenta was easily and safely removed.

DISCUSSION

Dr. Donald Macrae (Council Bluffs, Iowa): It has beer my fortune to have had two cases similar to the one reported

by Dr. Warren. One had passed the eleventh month and one the twelfth month, and the fetus was dead in both cases. The experience I have had in these cases has taught me that if we have a dead fetus to deal with and the woman has passed full term, the best way is to remove the placenta at once. I had no marked amount of hemorrhage in these cases. I removed the placenta with the child, as in Cesarean section, without any hemorrhage. But in looking up the literature, after I had reported one of these cases, I found it was good policy, if the child is living, to allow the placenta to remain and take care of it later. I believe in this way we avoid the hemorrhage of which the doctor speaks. I think that after a week or ten days, or later, the placenta may be taken care of with little or no hemorrhage. Dr. Warren seems to have had an alarming hemorrhage in his case; but my experience in taking care of cases where we find the fetus has been dead for some weeks, leads me to believe that it is better to remove the mass entirely. In both of my cases I stitched the sac to the abdominal wound and allowed drainage to take place from the sac. In both of them I had a hernia which necessitated a secondary operation.

Dr. John E. Summers (Omaha, Neb.): I would call attention to the fact that Dr. Werder has reported three cases and recommends the immediate removal of the placenta, claiming that the hemorrhage can be controlled by pressure on the aorta. I have had no personal experience with this method, but, it seems to me, it is good sense; yet when we get into trouble we want to get out of it the quickest way we can, and the suggestions that have been advanced are the preferable ones.

Dr. Archibald MacLaren (St. Paul, Minn.): I had one case which differed from those that have been narrated by Dr. Macrae, in that there was alarming hemorrhage at the time of the operation when attempting to remove the placenta a month after the death of the child. I stitched the sac to the abdominal wound and allowed the placenta to come away later.

Dr. Warren (closing the discussion): With reference to the remarks of Dr. Macrae, I will say that his advice to take away the placenta in a week or ten days is not in keeping with the pathology of what these vessels will do in that space of time. You will have free hemorrhage if you attempt that early, and clotting will not take place quickly. It takes from

four to six weeks before the veins are thrombosed and organized.

As to the remarks of Dr. Summers, who quoted Dr. Werder as advising the removal of the placenta whenever it is possible, to control hemorrhage: I will say that one patient died owing to a persistent effort to remove the placenta and trying to control the hemorrhage by pressure on the abdominal aorta. This patient lost so much blood that she died in his effort to remove the placenta. In the other case the veins ran up over the broad ligament into the sac in the placenta, he ligated and, fortunately, included the arteries supplying the placenta in the ligatures, so that he removed the placenta without any particular difficulty. But his second case, which he lost, according to the description of the technic of the operation, demonstrates positively the error he made in attempting to remove the placenta when he was unable to reach the arteries supplying it.

I think there is no question but what the placenta should be removed at the primary operation, provided the blood-supply can be controlled; and if we can reach the ovarian artery and the branches of the uterine artery at the horn of the uterus, there can be no particular danger now in ligating them or clamping them off, and then removing the placenta, which will probably come away dry. All of the placenta in my case was not removed. I anticipate, as Dr. Macrae has mentioned in his case, I shall have a ventral hernia to deal with, and probably shall have a chance, later on, to find what has taken place and the condition of the adhesions attached to the right side of the uterus, owing to the probable appendiceal complication.

A CONTRIBUTION TO THE SURGICAL TREATMENT OF RETRODISPLACEMENT OF THE UTERUS

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Displacement of the uterus, as a distinct entity, is met with in practice in perhaps one-third of the cases seen. It usually exists as a factor in, or more often as a result of, associated conditions which are more or less apparent as the individual case is made the subject of casual or careful study.

The organ, when in its normal position, is suspended in the pelvis by the broad ligaments, the fundus lying forward, and the cervix backward toward the hollow of the sacrum. It is very mobile and responds readily to slight pressure from above or below, and thus readily accommodates itself to varying conditions of the adjacent viscera, being pushed downward by pressure from above so as to assume a position of temporary anteversion, while force from the opposite direction may cause the fundus to rise with equal readiness to a point which amounts to retroversion.

To insure resumption of normal conditions when these temporary deviations occur there are other ligaments which then come into play. These are the round ligaments which are practically extensions of the uterine muscular tissue so prolonged that they pass out through the inguinal canal and find attachment to

the pubic bone. The uterovesical and the recto-uterine reflections of the peritoneum also exert a retentive influence upon the uterus to a minor degree.

When a retrodeviation is unduly protracted these correcting or retaining media may become so stretched or relaxed that they are no longer able to influence the return of the organ to position, or even to retain it after it has been replaced by manual or other measures. It sometimes happens also that the uterus is suddenly thrown into an extreme degree of backward displacement, past the point of greatest stretching of the round ligaments, when, as their elasticity has not been overcome, they then act as an aid in perpetuating the abnormal position. These cases are generally the result of traumatism, such as results from a fall from a horse or swing, and are often relieved by reposition of the organ and the use of some retentive measure for a short time, because the functionating power of the ligaments has not been destroyed by long-continued overstretching.

There are cases of uncomplicated displacement which exist in individuals who do not show evidence of impairment of the general health, and where the condition seems to be natural to the physical characteristics of the individual and is not associated with symptoms other than, perhaps, those of a neurasthenic or neurotic type. In such cases the local condition does not call for treatment, and it is better for both patient and physician if it be ignored. When, however, the displacement is accompanied by backache, leucorrhea, vesical irritation, constipation with its associated ills, dysmenorrhea, menorrhagia, or other catamenial abnormality it demands treatment, not so much because of the perverted position in itself, as of the inroads the accompanying conditions make upon the general health, and it may be accepted as a rule that relief of existing complications, restoration of the uterus to its normal position, and the use of retaining measures will, by the

improvement which follows in the local circulation and the relief afforded to perverted nerve influence, be the first, most important, and most logical step in the correction of these distressing complications.

There is another condition which is sometimes cured by correcting displacement of the uterus, especially retroflexion, and that is sterility, particularly when there are no complicating features. Treatment of this condition may be in the way of reposition of the organ in uncomplicated cases and by using a pessary or some other form of supporting measure, with the object of giving the stretched and devitalized retentive ligaments time to regain their normal strength and elasticity. Such treatment, however, is, and must be, regarded as being merely palliative in the great majority of cases, and resort to surgical measures is necessary to effect a cure that is in any degree permanent.

The operations in vogue for effecting retention are dependent upon two principles. One is suspension of the organ from the peritoneal lining of the anterior abdominal wall, and the other is by shortening the normal supports of the uterus, particularly the round ligaments, so as to render them again effective. The round ligaments are either shortened in the inguinal canal by what has become known as the Alexander method, or intra-abdominally when the excess of length in the ligaments caused by overstretching is taken up in loops and retained by sutures near the uterus.

I have not favored ventrosuspension as a retentive measure, for the theoretical reason that in so doing we are depending upon artificial means, which not only ignore the normal supports but put resumption of function on their part out of the question; and I have not practised it except in a few instances where other methods seemed inapplicable, and when the child-bearing prospects of the patient were no longer a factor. Whenever it has been feasible to do so, I have preferred to shorten the round ligaments, because the

method has appealed to me as being more in accord with physiological principles, inasmuch as it retains the normal uterine supports and restores their functional integrity. It has also been my aim to make the shortening in such a way as to retain, as nearly as possible, the original position of the ligaments so that the line or axis of their retaining influence is not changed, as altering their position or changing the direction of traction must, it seems to me, lessen their functional activity when called into play.

It is often difficult, and sometimes impossible, to determine the degree of uterine mobility with certainty without the aid of an anesthetic, and as the knowledge may be of great importance in determining the course to be taken to effect retention, I am in the habit of deferring decision in doubtful cases until the patient is anesthetized for operation, when I examine the patient once more to determine what character of procedure is best calculated to conserve her interests. If at this time the uterus is freely movable, and the adnexa show no signs of disease, and no other condition exists which makes opening the abdomen advisable, the ligaments should be shortened in the inguinal canal by the Alexander method, because the after-condition of the patient is likely to be better, all things considered, if the peritoneum has not been molested. If there is any uncertainty, however, as to the absolute mobility of the uterus the abdomen must be opened and the restricting influences, of whatever nature, must be overcome, or they will render nugatory any attempt to retain the organ in position. When the adhesions have been freed and reposition effected the ligaments may be shortened so as to secure retention by folding them upon themselves and including the excess in sutures.

My method of doing this, in accordance with the principles already mentioned of preserving the position and direction of the traction of the round ligaments, is, having the patient in the Trendelenburg position, to

catch each ligament with a tenaculum at a point of from one to one and a half inches from its uterine end, depending upon the amount of slack found, and drawing them forward until they are slightly tense, when it will be noticed that they lift the peritoneum, which covers them so that the vesico-uterine fold forms a sort of sulcus running from the bladder to the uterus. There is a redundancy of peritoneum between the raised ligaments here, owing to the stretching it has undergone, which I draw together from side to side, folding it upon itself and retaining it by a fine running-catgut suture, beginning at the bladder and following backward until the round ligaments are reached, thus making this peritoneal fold a factor in retention. A No. 0 chromic catgut suture is then passed through both segments of one ligament and securely tied so as to fold the excess upon itself forming a loop, taking pains to pass the suture so that the lower segment will be drawn up to the point where the ligament is attached to the uterus, thus preserving its direction of traction, as well as its position. After the other ligament is treated in a similar manner the two loops are folded over upon each other and fastened together, as well as to the anterior surface of the uterus.

While the technic is slightly different, the therapeutic principles involved are essentially the same as in the procedures of Wylie, Webster, Coffey, and others, inasmuch as they all utilize the peritoneum to a greater or less degree as an adjunct, and aim to restore the function of the round ligaments by taking up and disposing of their excess in length in such a manner as to reinvest them with a part at least of their original integrity; but I think that attention to the details of the operation with the view of preserving the normal direction and degree of traction of these ligaments is a very important feature, as it restores their functional activity to the physiological degree, and the uterus is mobile at an early date after the operation, which is

certainly a most desirable condition for the patient.

Coffey states, as the result of personal observation, that the round ligaments, when included in a series of absorbable sutures, together with their peritoneal covering, gradually free themselves from the strictures, which form as the result of adhesion of the peritoneal surfaces to each other and regain their elasticity, so that, in time, they became able to perform their usual function, and my experience would tend to confirm his conclusions.

The reports have been so favorable that I have come to regard the procedure as one from which I can expect definitely good results, and not be troubled by fears of failure, because the operation when made in this way is almost universally applicable, it is safe and easy to perform, and uterine reposition is definite and permanent; and, as the object of the procedure is restoration of the orginal normal conditions, it is found that relief to the patient is prompt to follow and disappearance of the distressing symptoms is the rule; and after all is said symptomatic relief is the most reliable test of the value of an operation of this character.

DISCUSSION

Dr. J. W. Andrews (Mankato, Minn.): Dr. Stewart has spoken of the use of the pessary as affording temporary relief. Personally, I believe the uterine pessary should be wholly, entirely, and forever banished from the armamentarium of the physician and surgeon. I do not believe it does any good.

As to the Alexander operation: It is performed much too often for the restoration of the retroverted uterus. It is an easy operation and, as a rule, a safe one, but my experience has been that where there is a retroverted uterus of marked degree there is also disease of the ovaries and tubes, one or both, which needs correction. An easy way to correct a retroverted uterus is, as the doctor has described, by shortening the anterior ligaments from the inside. Several methods have been used. I have used a method similar to the one that has been described by him. I am always a little afraid to double up the round ligaments and stitch them upon

themselves, as Professor Baer of Philadelphia taught a few years ago; but by the use of the Cleveland needle, transfixing the anterior portion of the uterus just beneath the peritoneum and drawing the ligaments through and stitching them, it gives a good, firm, reliable support. I believe this is a good way to correct a retroverted uterus.

DR. A. E. BENJAMIN (Minneapolis, Minn.): I can best illustrate what I mean by making a little drawing on the blackboard. I have always contended that any operation for shortening the round ligaments which leaves the weakest link in the chain, is wrong, so that any operation which doubles the ligaments on themselves, which leaves a weak support at the extremity, is a bad operation. I have tried all sorts of operations for the relief of these cases, and have at last come to the conclusion that a modified Gilliam operation meets the indications more nearly than any other. This operation is done, for instance, by a transverse skin incision, then a longitudinal incision through the muscle, dissecting the skin up, and passing the ordinary curved forceps through the abdominal wall opposite the internal ring, passing it in between the folds of the broad ligament along the ligament, and catching the ligament an inch and a half from the uterus, and bringing the ligament out at this point, then pulling up the folds of the broad ligament, so that you accomplish the purpose which Dr. Coffey has demonstrated to be satisfactory in his operation.

I think it is wrong to produce any unnecessary injury to any of the peritoneal tissue, and if we can prevent sutures from causing irritation within the abdomen, we shall not get adhesions or a troublesome condition following. By picking up the ligament at this point, bringing it out through this ring, spreading it out on the fascia and stitching it, we have a broad attachment for the ligament underneath the skin to the fascia, which holds the uterus in place. We do likewise on the other side.

It is necessary, of course, in all these cases to remember that this uterus must be maintained at right angles to the vagina, in order to accomplish the purpose desired. We cannot expect to get a good result unless we have the intra-abdominal pressure continually pressing upon the back portion of the uterus, and with the counterpressure of the perineum here to support it, and unless we have that principle in mind we shall never get a permanent result in our operative work in these cases. So it is absolutely necessary to have a good perineum in all these cases, with a light uterus, other-

wise we shall have a stretching of the tissues. This operation makes a complete support, and in cases where you wish to raise the uterus, when there is sagging, the attachment can be made a little higher than the internal ring. The advantage is that you do not have any point between the normal exit of the ligament and the point where you make the puncture, where the intestine can crowd in and become strangulated.

DR. STEWART (closing the discussion): I have studied and considered the Gilliam operation a great deal, and I have not used it myself for the reason that it is so much like a ventrosuspension. It affords definite support without doubt, but the retroverted uterus, if it can be replaced in its proper location and retained there for a little time, I am satisfied from my own experience and observation extending over a period of eight years, during which time I have watched the particular procedure I spoke of,—the ligaments regain their normal function, and then, if left in a normal position, they exert a perfect physiological retentive influence, that is, as it was previous to the time the retrodisplacement occurred. And that is the plea I make for this form of procedure, namely, it restores the uterus to its normal condition. It leaves it mobile, free from any undue restraining influence, and is simply retained until the ligaments can do their work. I have followed this course for about eight years, and in that time I have made a hundred and seven operations of this character, and every operation has been done for more than a year. I have had the opportunity of examining forty-three of these patients from time to time, and I have found no recurrence of the displacement in any case. During the past year I have made nineteen operations, which, of course, are too recent to formulate conclusions with regard to results, but my specific plea is that this operation enables us to restore the uterus to its normal physiological position.

COLLES' FRACTURE

JOHN W. ANDREWS, M. D.

MANKATO, MINNESOTA

One of the most important fractures with which the surgeon, and indeed the general practitioner, has to do, is Colles' fracture, first, because of its frequency; and, secondly, because of the deformities which so often follow and which are so conspicuous. These deformities are ever before the public advertising the physician in a way that he does not wish.

No one can be a good surgeon without first becoming a good anatomist. One may as well try to repair an automobile without a knowledge of the mechanism of the machinery as to undertake surgery without a knowledge, at least, of the surgical anatomy of the part, or parts, of the body he essays to treat. Without this knowledge either will be a dismal failure; the latter more than the former, because the one deals with dead matter, the other with vital tissue. The first essential, then, in diagnosing and treating Colles' fracture is a thorough knowledge of the surgical anatomy of the wrist. It is not necessary to know the anatomy in detail, e. g., one can diagnose and treat Colles' fracture perfectly without knowing the attachments of the extensor longus pollicis, although these minor details are desirable. He must know that the radius articulates with the scaphoid and semilunar, and that the ulna does not, *per se*, enter into the wrist-

joint, except through the intervention of the triangular fibrocartilage. It is essential to know that the radio-ulnar articulation is formed by the head of the ulna fitting into the sigmoid cavity of the radius, and the bones are held in juxtaposition by small transverse ligaments, together with the triangular fibrocartilage. This little cartilage is one of the most important structures in the wrist-joint. It is attached by its base to the osseous border of the radius formed by the sigmoid cavity and the articular surface of this bone, and by its apex to the base of the external surface of the styloid process of the ulna. The lower end of the radius is thick and is widened by the large styloid process, and is composed of a mass of spongy tissue and a thin layer of cancellous tissue. The anterior lip of the radius projects prominently to the front. The posterior lip is on a plane with the posterior surface. The flexor and extensor tendons of the hand and digits pass over the wrist anteriorly and posteriorly, respectively, but no muscles are inserted into any of the bony prominences about the wrist that materially influence the reposition of the parts concerned in Colles' fracture or the deformity which may follow. The question of muscular contraction or tension does not enter into the fracture.

The prominent external landmarks are the styloid processes (radius and ulna), the head of the ulna, the anterior lip of the lower end of the radius, and the thenar and hypothenar eminences.

In the normal wrist the styloid process of the radius is on a somewhat lower plane than the corresponding process of the ulna. The base of the thenar eminence is lower (i. e., nearer the hand) than the hypothenar. The head of the ulna is prominent posteriorly while the anterior lip of the radius can easily be palpated anteriorly. I should like to take all of the above-enumerated anatomical points seriatim, and demonstrate the

value of a knowledge of these, both in the diagnosis and the treatment of Colles' fracture, but the scope of this essay will not permit.

The cause of Colles' fracture probably in 90 per cent of the cases is a forward fall striking forcibly upon the palm of the hand. The mechanism of the fracture of the lower end of the radius, in consequence, is exceedingly interesting. The anterior ligament is first made extremely taut. If the force of the fall is not yet spent either the ligament must give way, the carpal bones break, or the lower end of the radius fracture. The anterior ligament is attached to the anterior projecting lip of the radius above, and to the anterior surface of the cuneiform below, principally, so that we have the principle of a lever applied with the power at the cuneiform, the fulcrum at the scaphoid and semilunar, and the weight at the anterior lip of the radius. The most usual lesion therefore is a cross fracture of the lower end of the radius. This is Colles' fracture. In addition to the cross-breaking strain is a vertical force due to the impact of the hand upon the ground, to which and through the arm is transmitted the weight of the body. The effect of this vertical force is to carry backward and upward the lower fragment of the radius, and if this vertical force is not yet spent the sharp posterior border of the upper fragment is impaled into the spongy lower fragment. Let it be remembered that the triangular fibrocartilage is attached by its base to the lower margin of the sigmoid cavity of the radius, and by its apex to the base of the external surface of the styloid of the ulna. In consequence of the traumatism above described the cartilage is torn off from one or the other or both of its attachments. The radio-ulnar ligaments, not necessarily the interosseous, are either strained or ruptured, and the head of the ulna is forced to the front. Then we have a picture of the lower fragment of the radius

in a posterior position impinging upon and pushing the extensor tendons and overlying tissues backward, and the head of the ulna and lower end of the upper fragment of the radius crowding forward the flexor tendons and the tissues overlying them.

These changed positions produce a characteristic deformity known as the "silver-fork" deformity. The soft tissues about the wrist-joint coincident with the bone lesions above described are lacerated, the ligaments are stretched or torn, sometimes the tendon-sheaths are lacerated, and blood is extravasated into the synovial sack, and thus we have a picture of a very serious injury.

DIAGNOSIS.—In Colles' fracture the base of the thenar eminence is higher (that is, nearer the wrist) than normal, and the slope from this eminence is more abrupt. The head of the ulna, which is usually so prominent posteriorly, disappears from behind and appears in front. The styloid of the radius is on a plane as high as, and often higher than, that of the ulna. The wrist is broadened because of the rupture of the inferior radioulnar ligaments, and separation of the triangular fibrocartilage from one or the other of its attachments. The lower end of the upper fragment projects forward, causing a protuberance anteriorly; and the lower fragment is thrust backward, causing bulging posteriorly. These abnormal positions and conditions are sufficient for a diagnosis, and, except in a very fleshy arm, can be determined by inspection supplemented by gentle palpation.

Another form of Colles' fracture, "the reversed Colles'," in which the lower fragment is dislocated forward, I shall not describe in this essay. Suffice it to say this form of fracture is very rare. When the surgeon is called to attend a fracture, as a rule one of the first things he thinks of, and one of the first things he does, is to determine whether or not crepitus

exists, as though this one symptom overshadowed everything else. This is one of the most unreliable symptoms in Colles' fracture, for it is absent more times that it is present. The same is true of abnormal mobility. As a rule, therefore, anesthesia is not necessary for diagnostic purposes in Colles' fracture.

I cannot leave the subject of diagnosis without strongly advising the use of the *x*-ray as a supplementary means to a clear-cut, accurate diagnosis.

TREATMENT.—Of course, the first step toward successful treatment is complete reduction of the parts to their normal position. This cannot be done without an anesthetic. The writer believes that this should always be given, and if the diagnosis is not clear it can be cleared up at this time. Rough, unsystematized handling will still further injure the already injured parts, and is unsurgical and unscientific.

The books usually describe the manner of taking hold of the parts for the purpose of reduction. This is confusing to the tyro and useless for the adept. The surgeon must know his anatomy and determine accurately the character and extent of the injury, then restoration under an anesthetic will come easy without fixed rules. Upon the following, however, will hinge the success or failure of the treatment. The lower fragment of the radius is partially or wholly displaced, and this must be brought back to its normal position, end to end with the upper fragment. Because of the rupture of the inferior radioulnar ligaments the bones separate, and the wrist "spreads." The bones must be brought back into juxtaposition, so that the head of the ulna will rest in the sigmoid of the radius. The head of the ulna is displaced forward and loses its posterior prominence. This must be placed backward in its normal position and there retained. Lack of attention to any one of these conditions will cause permanent deformity. To think that a Colles' fracture is

set when the lower fragment of the radius is brought back into position, is a mistake that has brought sorrow to many a surgeon after union takes place.

The most frequent permanent deformity is the slumping forward of the ulna, and the next most frequent is the so-called "spreading," or widening, of the wrist.

It sometimes happens that the force of the falling body (human body, I mean), transmitted to the wrist, is so great that the lower fragment is pressed out of shape (it is largely spongy tissue), so that it is wider from side to side and broader from front to back, and this compression is not equal in all parts of the fragment. For this reason the articular surface is made to look in an abnormal direction. The widening and broadening and the changed articular surface are deformities, and always will be permanent; they are irremediable.

At the risk of being prosy I must call your attention to one other point in reducing this fracture. It frequently happens that the cross-break of the radius is incomplete posteriorly, i. e., the periosteum is left intact. If one tries to reduce the fracture by extension and forward pressure he will only lock the lower fragment against the upper without reducing it, and the stronger the extension the firmer will the locking be. It is clear to every intelligent physician that the remedy here is to increase the backward flexion while extension is being made. Whatever may be the character or extent of a Colles' fracture, and no matter how poorly reduced, healing takes place very rapidly: the bones will be united in three weeks' time. When the fracture is once well reduced there is very little tendency to recurrence, and the parts are easily held in position by some simple dressing. Whatever form of dressing is selected the arm should be dressed in a semiprone position, and placed in a cravat-sling,

which should not extend below the head of the ulna.

No dressing should include the fingers. Some surgeons are content with a simple, firm bandage about the wrist, after the parts are put well in position; others use a posterior splint only; others, an anterior splint. For several years past the writer has used both the anterior and posterior splints, extending from a little below the elbow to the knuckles. These have been well padded with sheet wadding, firmly though not tightly pressed together, and a pad placed against the lower fragment of the radius behind and against the head of the ulna in front and to the inner side. Strips of adhesive plaster are used to hold the splints in position, and these are further secured by a roller bandage. My results have been good. I should be afraid to risk the simple bandage. Although the posterior splint dressing would be in most cases satisfactory, my objection to it is that one cannot so well prevent anterior slumping of the head of the ulna. I do not use a plaster-of-Paris dressing for Colles' fracture at all.

AFTER-TREATMENT.—Many good surgeons recommend early passive motion. I do not believe that passive motion does a great deal of good, and I am sure it can do much harm. It keeps the joint irritated and inflamed, increases the amount of callus, and causes the patient useless suffering. Early active motion, i. e., as soon as good union has taken place, will lead to a perfect functional result. Early massage, if gentle, is not only permissible, but is to be recommended.

DISCUSSION

DR. JOHN P. LORD (Omaha, Neb.): I have always felt my indebtedness to my old professor, Dr. Moses Gunn, for a rule which he laid down for the reduction of fractures and dislocations, that is, to first put the parts into the position that characterized them at the time of the injury. It has been my observation that most men have erred in the treatment of Colles' fracture, by simply using extension and

then depending too much upon their fixation-dressings for their results. It is my usual custom to put a case of Colles' fracture across my knee and turn it directly at right angles, without adding damage to the injury already done, and bring it around into position; and where the periosteum has not been torn on the posterior surface, it is difficult to accomplish that result until you have actually torn the periosteum across that point. Being thoroughly convinced for many years of the desirability of the most perfect reduction in these cases, my experience has been that of all others who have advanced their opinions on this subject, namely, that very little is required in the way of dressing, and it is my observation that the cases of stiff wrist and deformity have come from too great an amount of pressure, and the stiffness comes in spite of early manipulation. I no longer have the trepidation in regard to stiff wrists that I once had. I believe it is largely due to a more correct understanding of the necessities of the case at the outset.

I agree with the essayist that a splint longer than that which reaches to the metacarpophalangeal joint is unnecessary. I make it a practice in all such cases to anticipate union by an examination, so as to be sure the reduction which I have made has been retained, before the final union takes place. I think we make mistakes sometimes in allowing patients too great freedom and in being too certain of everything being all right, because we do not know. Many of these cases are not readily held in place, and they require to be overhauled two or three times before we finally get the fragments retained. This is not the general rule, but exceptionally it is.

DR. ANDREWS (closing the discussion): I am very much obliged to Dr. Lord for his discussion. We are all prone in cases of Colles' fracture to be satisfied with a good functional result, and I believe there is every surgical reason why we should get not only a good functional result, but, in the great majority of cases, result free from deformity. During the past six years my partner and I have had a considerable number of cases of Colles' fractures, and we have made them a special study, and have endeavored to get results without deformity. We have been quite successful in that regard. Since my own son has been in partnership with me, the last six months, we have had six cases, and after union had taken place and the splints been removed, it would be difficult for any man to determine that there had been a fracture.

As I emphasized in my paper, we must look out for the spreading of the fragments, as this deformity is likely to exist.

Another thing is the slumping forward of the head of the ulna. If the surgeon looks well to the prevention of these two deformities, he will likely get good results, free from deformity.

A STUDY OF THE ACTION OF SCOPOLAMINE-MORPHINE ON THE HEART, LIVER, AND KIDNEYS, WITH A REPORT OF SIX HUNDRED AND FIFTY CASES OF SCOPOLAMINE-MORPHINE ADMINISTERED AS A PRELIMINARY TO GENERAL ANESTHESIA

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Scopolamine was discovered by Schmidt in Warbury in 1820 and was at that time obtained from a plant called *scopola,* named by Scopoli, the Austrian naturalist.

Scopolamine hydrobromide is an alkaloid, now obtained from roots of various plants of solanaceæ (night-shade family). It is identical, chemically and physiologically, with hyoscine. This family includes scopola, belladonna, stramonium, hyoscyamus, etc.

When injected alone scopolamine does not cause anesthesia, but in combination with morphine (in sufficient dose) it produces an anesthetic state.

The claim has been made that scopolamine loses its power if kept in solution, and this change in solutions of scopolamine a week old I have noted. But scopolamine in tablet form I have found reliable, and I see no advantage in using the crystals. For an injection

as a preliminary to ether anesthesia I have used the tablets of scopolamine and morphine, and these same tablets were used by me for animal experimentation.

PURPOSE OF USE

The object of the use of scopolamine and morphine in patients, was, first, to produce complete anesthesia alone. Then in case of failure, as sometimes occurs, it was necessary to use only a slight amount of chloroform or ether to complete the anesthesia. The purpose has been, later, to use it as a preliminary injection to ether or chloroform anesthesia, which decreases the amount of ether or choloroform, and prevents the distressing symptoms which often follow anesthesia.

DEATHS ASCRIBED TO SCOPOLAMINE

A number of deaths reported after operation in in which a post-mortem examination was made and been reported. I have separated them into (a) those in which a post-mortem was made and (b) those without autopsy findings.

a. Deaths with autopsy performed.

Dirk (Deutsche Med. Woch., 1905, No. 10) reported three cases. Two cases of carcinoma of the colon and one case of carcinoma of the rectum. The first two cases showed purulent peritonitis at autopsy. The third case was in bad condition surgically, and the autopsy showed extensive metastases.

In these cases death took place several hours after operation and could not have been caused by the administration of scopolamine.

Blos von Burns (Beitrage zur Chirugie, XXXV, 3) describes a case of tuberculosis and emphysema. The patient was fifty years of age and at autopsy showed extensive lesions of tuberculosis and amyloid degeneration of the viscera. He could not say that scopolamine had anything to do with the death of the patient.

Bokes (Langenbeck's Archiv., XXIV, 4) reports three cases of death following the use of scopolamine.

In only one case was there an autopsy performed. This was an old osteomyelitis of the femur in which there had been great hemorrhage. He characterizes it as a desperate case and did not believe that scopolamine injections had anything to do with death.

Sexton (Lancet-Clinic, V, November 18, 1905) had a case of uterine fibroid which had had extensive hemorrhages. The autopsy was superficial and showed nothing.

Isreal (discussion in Deutche Med. Woch., 1905, No. 10) reports three cases, upon two of which an autopsy was performed. The first was a case of tuberculosis of the kidneys. The autopsy showed fatty degeneration of the heart and liver, and cloudy swelling of the remaining kidney. The second was a case of ruptured pyosalpinx. The autopsy revealed extreme fatty degeneration of the liver, heart, and kidneys. The spleen was not enlarged.

In the consideration of these cases, there is not a single instance in which death can be attributed to scopolamine. They are all desperate cases. The time which elapsed before death took place after scopolamine was administered is not given in these reports; however, in many cases death occurred several days after the operation was performed.

b. Deaths in which no autopsy was performed.

Flateah (Muenchener Med. Woch., 1903, No. 28) reports a case of a woman of fifty-two years with polypus of the uterus. Clinically, she died from edema of the lungs. No autopsy was performed.

Landen (Deutsche Med. Woch., 1905, No. 28) operated on a case of hemorrhoids, and the patient died a few hours later from collapse.

Bokes (Langenbeck's Archiv., XXIV, 4) reports two cases in which death occurred after operation. The first case was carcinoma of the uterus. The patient suffered severely from hemorrhage and shock. The second was a sarcoma of the neck in a woman of

fifty years. The heart was sound and the pulse good, and there was no loss of blood. No autopsy could be obtained.

A. C. Wood (American Medicine, November 11, 1905) reports an operation for prostatectomy in a colored man of ninety-four years of age in which death took place after operation.

Witzel (Muenchner Med. Woch., 1902, No. 48) describes a case of prostatectomy in which scopolamine had been administered previous to operation, death being caused by septic infection.

Wild (Berlin. Klin. Woch., 1903, No. 9) reports a case in which untoward symptoms appeared in a case after operation, but the patient recovered. He operated on an empyema of the antrum of Highmore, and collapse with Cheyne-Stokes respiration followed.

In these cases in which no autopsy was performed, death can, in every instance, be explained in some other way than by attributing it to the injection of scopolamine.

In this connection it is of interest to refer to the work of Bevan, Favill, and others (Jour. A. M. A., September 2, 1905), who described the occurrence of late poisonous effects after the administration of chloroform, which is manifested chiefly in a fatty degeneration of the heart, liver, and kidneys. This condition, then, may occur without the use of scopolamine.

REVIEW OF EXPERIMENTS UPON ANIMALS

Very little animal experimentation has been done with scopolamine and morphine since they have come into prominence as an injection preceding the administration of the general anesthetic. Most of the work with this drug has been done by chemists, consequently little of its pathological effects has crept into medicine.

Whitacre (N. Y. Med. Jour.) has given dogs, cats, and guinea-pigs repeated injections of scopolamine and morphine, and in a preliminary report states that it produced fatty degeneration of the liver and kidneys,

and probably of the heart also, in two cases.

Kochman (Therapie der Gegenwart, May, 1903) states that he has seen no death resulting from its use in patients, and that as much as thirty grains injected into a rather large dog will not cause the death of the animal.

Because of these meager results I determined to find out the effects of scopolamine and morphine injections upon animals.

ANIMAL EXPERIMENTATION WITH SCOPOLAMINE AND MORPHINE

1. Experiments upon rabbits.

The injection of a single dose of scopolamine, gr. 1/100, and morphine, gr. ¼, simultaneously into rabbits, produces a stupor, lasting four or five hours, which is followed by complete recovery. When such an animal is killed the following day no pathological change can be found. When rabbits are injected daily for as long as fourteen days and then killed, no lesions are produced. Such animals do not lose in weight and, to all appearance, remain perfectly normal. The killing of such injected rabbits upon successive days, shows nothing abnormal.

The injection of a larger amount of scopolamine and morphine produces no different results, with the exception that the resulting stupor is prolonged. I have injected daily scopolamine, gr. 1/50, and morphine, gr. ½, for ten days into rabbits, with no change in the physical condition being produced and with no lesion, upon killing such animals, after repeated injections.

The toxic or fatal dose of scopolamine and morphine for rabbits when injected in the same proportion as used in patients, previous to the administration of ether, is, scopolamine, gr. 1/10, and morphine, grs. 2½. This amount appears to be the average fatal dose for rabbits with evidence only of morphine poi-

soning. Any large healthy rabbit dies after a number of hours from such an injection.

The autopsy on rabbits that have been injected with a fatal dose of scopolamine and morphine, shows practically death from asphyxia. Examination shows the heart, liver, and kidneys of rabbits killed by a toxic dose of scopolamine and morphine to be congested.

2. Experiments upon guinea-pigs.

I have injected guinea-pigs with scopolamine and morphine in the same manner as the above-described experiments upon rabbits. Single or repeated daily injections for a period of fourteen days produce no pathological changes. The repeated daily injection of twice the dose given patients by me as a preliminary injection to ether narcosis, is well borne.

When such animals are killed after successive injections from one to fourteen days no lesions are found. The fatal dose is the same as that for rabbits, and the autopsy from a guinea-pig dead of a toxic fatal dose of scopolamine and morphine shows only congestion of the viscera.

3. Experiments upon cats.

I have injected scopolamine and morphine into a limited number of kittens. The repeated daily injections produce no degeneration of the heart, liver, or kidneys. The fatal dose for kittens was found to be, scopolamine, gr. 1/5, morphine, grs. 5, death resulting from the morphine.

The injection of a single dose of morphine, gr. ¼, and scopolamine, gr. 1/100, into a kitten is followed, not by sleep, but by excitement. The animal staggers about and remains aroused for several hours. This action was not produced in other animals that were injected. The injection of larger doses, twice or three times the ordinary dose, does not cause a more marked period of excitement. Continued daily injections seem to produce a tolerance for the drug.

4. Experiments upon dogs.

I have injected scopolamine, gr. 1/5, and morphine, grs. 5, into a small dog, which caused death. The pathological-anatomical findings were those of asphyxia.

The effects of injections of scopolamine and morphine into animals are similar to those of morphine when given alone. It was therefore necessary to try the effect of scopolamine without the addition of morphine.

INJECTION OF SCOPOLAMINE

The daily injection of scopolamine, gr. 3/100 to gr. 1 1/20, into rabbits, guinea-pigs, and kittens produced no pathological changes, even when continued for two weeks. The heart, liver, and kidneys of such animals, when killed after fourteen injections, are normal.

The fatal dose of scopolamine for these animals I have not determined. I have given a small cur dog scopolamine, grs. 5, without causing death.

Small kittens, when injected on two successive days with scopolamine, grs. 3, did not succumb. When killed no pathological changes in the heart, liver, and kidneys are present at autopsy. It is apparent that enormous doses of scopolamine can be given to animals without causing death.

INJECTION OF MORPHINE

In order to determine the result of morphine without scopolamine, a number of rabbits were injected with morphine, gr. ½. The onset of the symptoms was not earlier than half an hour. The rabbit becomes quiet, nose and ears appear cyanotic, and the respiration becomes less rapid. These symptoms increase in intensity for about thirty minutes, and then the effects begin to wear off.

Upon rough handling the animal is easily aroused, and at no time is narcosis so intense that the animal may be cut or operation done as when the morphine is combined with scopolamine. After injections of rab-

bits for several days the drug does not produce such marked symptoms as with the first injection. They apparently very rapidly acquire a tolerance for morphine.

When guinea-pigs are injected with morphine the symptoms, which are identical with those of rabbits, appear a little earlier. At the end of twenty minutes the animal is in a state of quiet, the eyes remain wide open, and the animal is cold. It can be readily aroused, and if pain is inflicted will protest. The sleep is of short duration, lasting about half an hour. They do not acquire a tolerance as rapidly as rabbits.

INJECTION OF MORPHINE AND ATROPINE

When morphine, gr. ¼, with atropine, gr. 1/100, is injected into a rabbit the narcosis produced is not so intense as when morphine is injected alone. Atropine inhibits, in some degree, the effect of morphine. The animal is easily aroused.

INJECTION OF ATROPINE

Atropine sulphate injected into rabbits in doses of gr. 1/100 to gr. 1/200 produces rapid respiration and marked excitability.

RESUME

I have killed my animals after injection upon successive days, so that I had the opportunity of examining the viscera daily after successive injections—from one to fourteen days. This was done in order to see if any change was produced in the heart, liver, or kidneys by the injections, and after what injection it took place.

The result of my experiments show that in death from scopolamine and morphine the findings are those of passive congestion. I cannot confirm the observations of those who are able to produce fatty degeneration of the heart, liver, or kidneys.

Animals bear hypodermic injections of scopolamine

and morphine well. If such injections are given repeatedly at long intervals, they do not interfere with the nutrition of animals, unless doses are so frequently given that the animals experimented upon remain more or less constantly under their influence; that is, in a comatose or semicomatose state.

The study of these results shows—

1. The effects of the injection of scopolamine and morphine into animals were similar to morphine when given alone, with the exception of the injection into kittens, where excitement, instead of sleep, was produced.

2. Continued repeated daily injections produce no degeneration of the heart, liver, or kidneys; and the physical condition is not impaired so long as the injections are given at such intervals as not to interfere with the animal's nutrition. Daily injections of from one to three times the dose given to patients produce no pathological changes in animals.

3. The toxic dose of scopolamine and morphine in my experiments corresponds very closely to that of morphine alone for the animals used.

4. The autopsy findings upon animals which succumb to a toxic dose are the same as those for morphine, i. e., congestion of the viscera.

5. My animals seemed to acquire a tolerance for the drugs upon long-continued daily administration.

The cause of death in patients who have died after operation and who were previously given scopolamine, has been more readily explained as due to great loss of blood during or before operation, to sepsis, or to shock. They have been desperate cases, and in not a single case could scopolamine be said to have produced death.

Scopolamine by itself is very slightly toxic for animals, and certainly does not produce any degeneration of the heart, liver, or kidneys.

REPORT OF SIX HUNDRED AND FIFTY CASES OF SCOPOLAMINE-MORPHINE ADMINISTERED AS A PRELIMINARY TO GENERAL ANESTHESIA

I have injected scopolamine, gr. 1/100, morphine, gr. ¼, three-quarters of an hour before the administration of ether, as a preliminary to general anesthesia in 650 cases. In this series the extremes of life have been avoided. In 6 per cent of cases there has followed practically no result, but in the remaining 94 per cent I have noted a quiet state of the nervous system previous to operation, that there has rarely been an instance where the patient became excited or struggled during the administration of the anesthetic, the absence of mucus in the patient's throat, a lessening by 50 per cent of the amount of ether used, the existence of quiet for some hours following operation, and the absence of post-operative vomiting.

LITHOPEDION

DAVID W. BASHAM, M. D.

WICHITA, KANSAS

The term *lithopedion* is derived from two Greek words meaning a *stone* and a *child*, and consequently signifies a *stone-child*. The fetus becomes solidified by the deposition of calcareous salts in the tissues of its body. In order for the process of calcification to be complete or even very extensive the fetus must have been retained for a great length of time. Other changes that a fetus may undergo when long retained are maceration, mummification, putrefaction, and saponification.

Maceration is the most frequent form of post-mortem change in the fetal body long retained. Mummification usually occurs in the fetus that has perished at the age of several months and where the membranes have remained intact. In order for complete absorption to take place fetal life must be interrupted prior to the twelfth week.

Putrefaction does not take place while the membranes remain intact. In the process of saponification or adipoceration there is elaborated in the body of the child, after death, the margarates of sodium, potassium, and cholesterin, and gradually a mass of adipocere comes to replace the fetus.

True lithopedion may take place *in utero* or *extra uterum*. Not every case of fetus retained *in utero* or *extra uterum* results in the formation of a lithopedion.

The skeletal parts of a fetus long dead in the maternal body may be discharged through the rectum, the bladder, the abdominal parietes, or even *per os*. There are numerous cases reported verifying all of this.

The presence of a dead extra-uterine fetus in the body of a woman does not seem to preclude the possibility of subsequent pregnancies. Pregnancy under these conditions may go on to full term. This is especially true in the case of lithopedion. There are numerous instances recorded where a lithopedion has been carried for many years, in some cases as long as fifty years.

The variety of lithopedion referred to in this paper is the extra-uterine. As the petrified fetus is almost always found in the cavity of the abdomen among the intestines, the question very naturally arises as to the original site of the pregnancy; that is, did pregnancy take place in the abdomen, or in the tube or ovary, gaining access to the abdominal cavity through rupture of the peritoneal coats of the ovary or tube, and surviving the accident?

There are many who maintain that true abdominal pregnancy cannot occur. While the evidence is quite sufficient to show that pregnancy may occur in the abdominal cavity, it is extremely probable that most cases of abdominal pregnancy are instances of tubal or ovarian pregnancy where the fetus has escaped through the fimbriated extremity of the tube or by way of a rupture in the walls of the tube or peritoneal covering of the ovary without disturbing the placental attachment.

In the case to be reported to-day there is nothing in the history of the patient to warrant an opinion that it was not a case of abdominal pregnancy to begin with. There were none of the phenomena attending rhexis of the tube or ovary in the early weeks of gestation, such as we see in the ordinary cases of extra-

uterine pregnancy. Absence of these manifestations does not preclude the possibility of an original ovarian or tubal pregnancy, for it is possible for fecundation to take place in the fimbriæ of the tube or near the surface of the ovary where rupture would be attended with no noticeable symptoms.

CASE.—Mrs. A. E. C., twenty-two years of age. Married at the age of seventeen years. A child was born at the age of eighteen years. No miscarriages. Patient's father is living and in good health; mother died at about the age of thirty-five. The subject of this report was in good health before her marriage and until the birth of her child, which occurred February 9, 1905. She flowed for eight weeks after the birth of the child, after which she menstruated regularly every three weeks until April 14, 1906, fourteen months after her confinement, when she became pregnant in the abdomen. She did not menstruate again until December, when she began to flow again and was regular. According to the patient's version, she became pregnant about April 22d, and felt quickening the last of August for the same year, 1906. The movements of the child were natural and unattended by great pain until November 2d. On this date she exerted herself quite considerably while papering her house, after which the fetal movements were almost constant and attended by great pain. The suffering was most intense in the left side. The fetal movements were accompanied by great pain from November 2d to November 15th, when motion ceased altogether and the pain subsided.

On December 11, 1906, she menstruated and was regular every three weeks. Her health suffered, and, as she expressed it, she was "up and down." She could feel the child in her abdomen.

On October 5, 1908, she entered the St. Francis Hospital. The fetus could be felt in her abdomen, and

the irregularities of its body could be outlined by palpation. It was freely movable and shifted about in the abdomen as the patient changed the posture of her body. It remained, however, rather high in the abdomen.

Celiotomy was done on October 9th and the fetus was removed. It was found occupying the upper part of the abdomen. It was enveloped in omental adhesions. There was no trace whatever of the placenta or cord. The omentum was adherent to various parts of the fetus, and it looked as if there had once been some connection between the maternal and the fetal circulation through the medium of the omentum. Otherwise it would be difficult to understand how the perfectly firm adhesions could take place between the various parts of the fetus and the maternal omentum. It is further to be remarked that there is a firm coalescence between the left arm and the body of the fetus, and the fingers are inclined to be webbed. Of course, these are changes which might and probably did occur *ante mortem*.

The patient made a very good convalescence, notwithstanding some pulmonary manifestations, probably referable to the ether, which was the anesthetic employed.

THE SKIAGRAPHY OF THE FUTURE

J. RUDIS-JICINSKY, M. D.

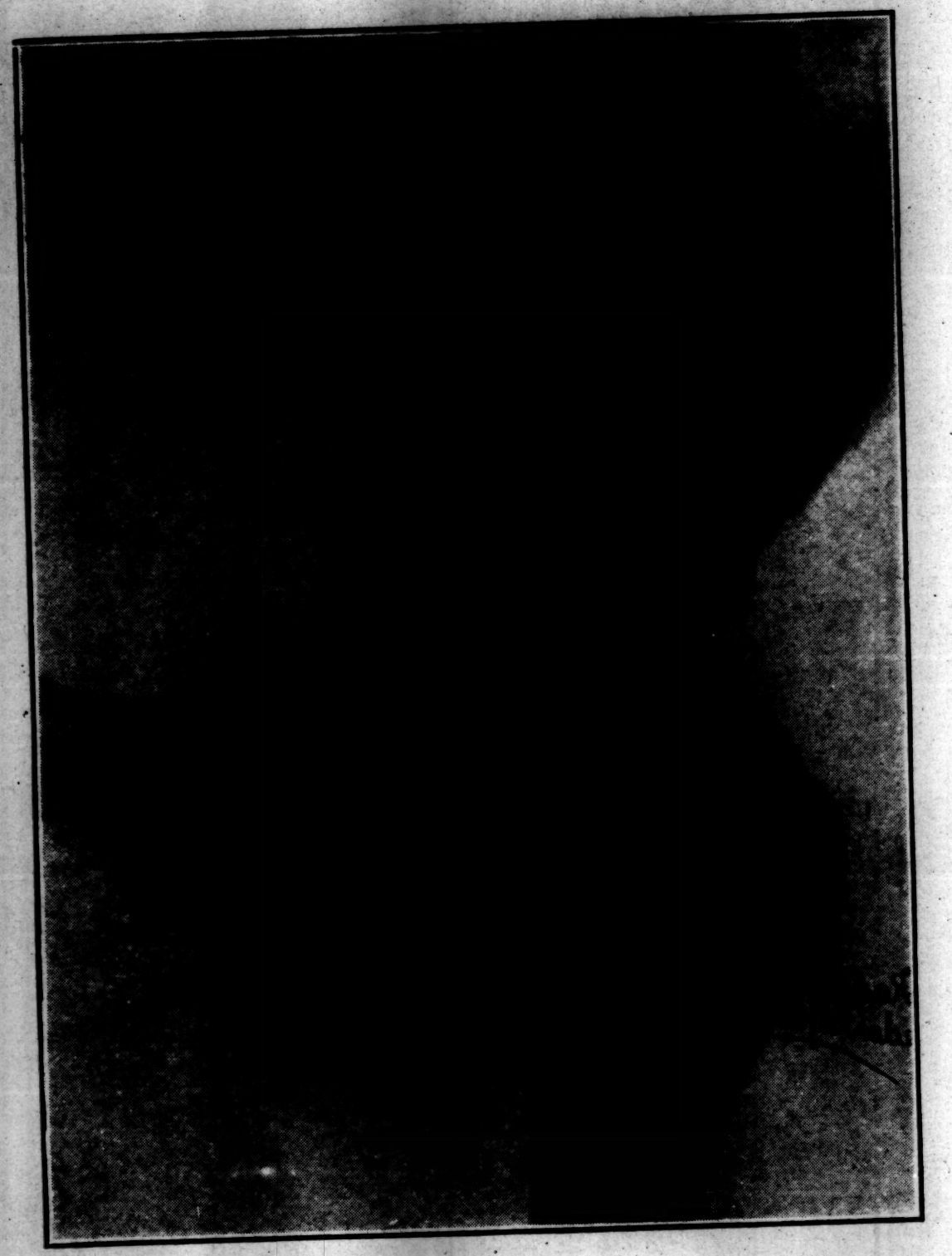
CEDAR RAPIDS, IOWA

We are writing 1908, a new year, a new year of new work. Progress and modern methods everywhere! Our surgery seems to be at the zenith of its glory and with our medicine, both are much better prepared for absolutely correct diagnosis of human ails, injuries, and misfortunes. Our motto, "Relieve suffering and prolong life," seems to be known to every surgeon and physician in the land of liberty, and wonders, unthought of ten years ago, are the fruits of constant struggle, learning, experimenting, research, and honest efforts of the humble servants of the art and science. And we still strive to open the path to the myriad wonders of Nature, which altogether unseen by the unassisted eye, are made cognizable to the sight of our new methods of diagnosis, methods bringing us to better surgery and medicine. Like the work of some mighty genie of oriental fable, the comparatively small glass tube (Crooks' tube) is the key that unlocks a world of wonder and beauty, before invisible,—beauty of creation, life of human body, and evolution of the same. We have in the last few years again swept rapidly across the vast field of marvels, and our skiagraphy gave us a gem here and there.

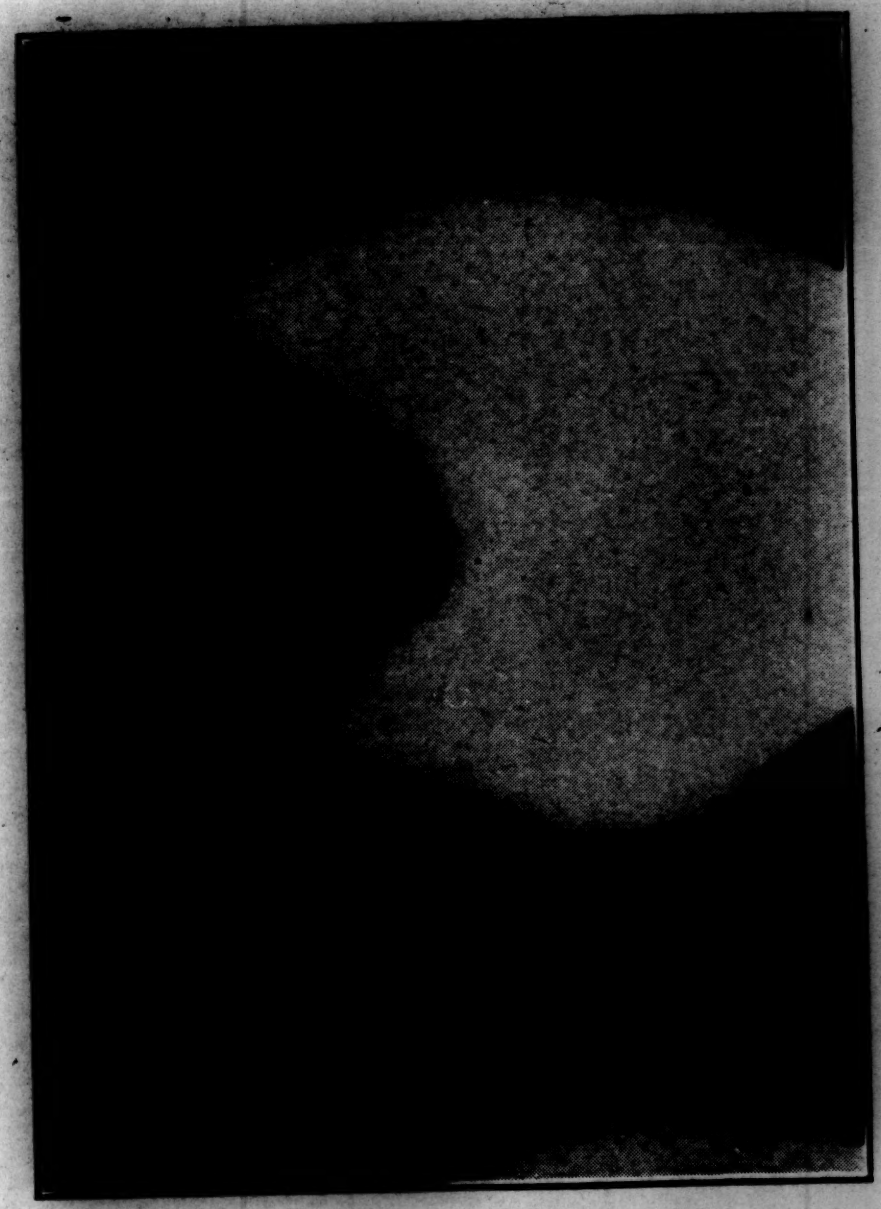
At this time every surgeon has an apparatus for *x*-ray diagnosis, and considers the same an absolutely essential part of his equipment. It is a very simple, portable high-frequency and *x*-ray outfit, which fully answers every purpose in diagnosis, skiagraphy, and

treatment of different, even malignant, lesions. It occupies but little space, operates equally well under all atmospheric conditions, and its manipulation is very simple. No necessity for large induction coils any more, requiring special installation; no static machine and resonators, because in this little and portable apparatus we have also the D'Arsonval, Oudin and Tesla currents, combined, and can attach the same to any socket in any office, room of our patient, or hospital, or connect the same with the street-lighting current available. It is always ready to operate by turning a switch and attaching to the nearest electric source. And from this comparatively small outfit we can obtain all the high-tension, high-frequency modalities used in modern therapeutical practice and the most beautiful results in the photography of invisible, especially if we employ in this kind of work a good tungstate-of-calcium screen of very fine grain right against the film of our photographic plate, in the black envelope and orange cover, and our compression diaphragm right against the part to be photographed. In this way we can take skiagraphs or radiographs in seconds instead of minutes, and do not use very much of the amount of the current, and there is no electrolytic or mercury interrupter to bother with, and very good rays can be concentrated, so to speak, over the subject of ours, which if properly posed and illuminated will give us the best proofs of absolutely correct diagnosis with better detail, substance, and perspective in the negatives, obtainable from wide range of tubes.

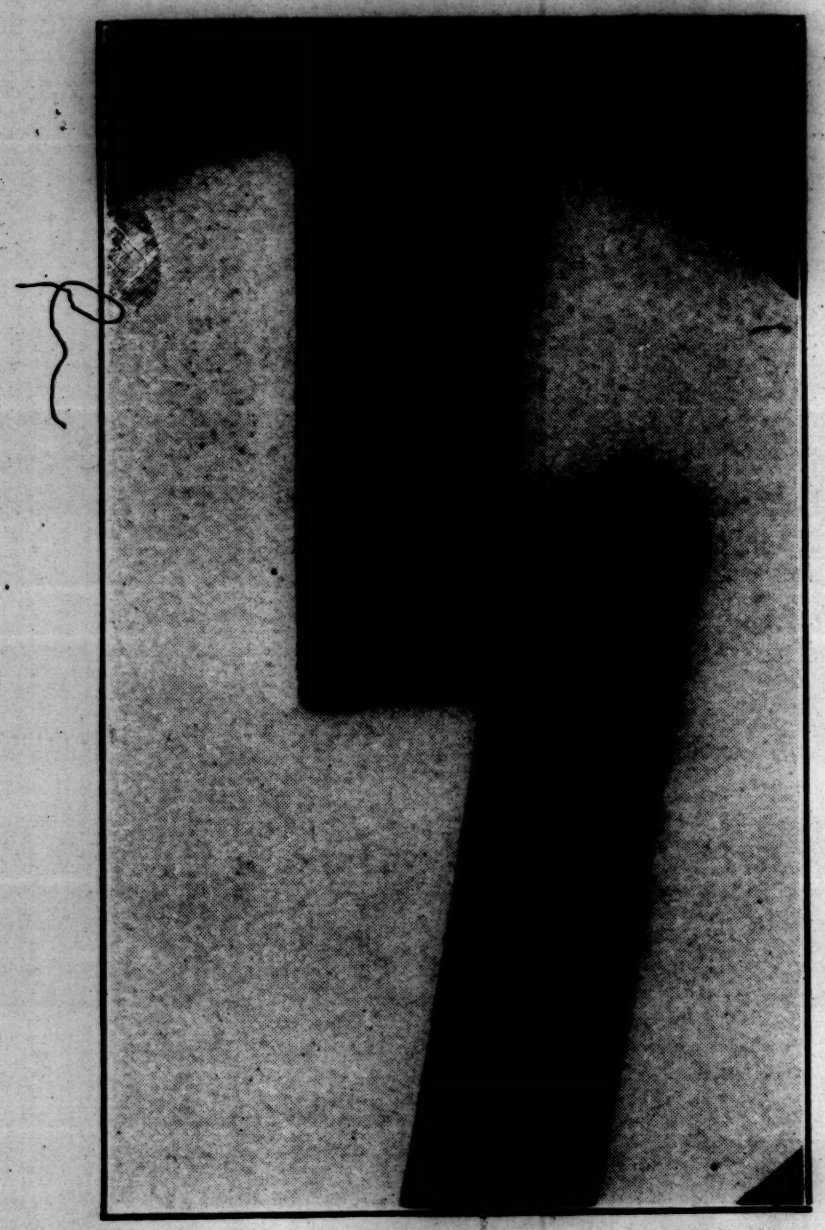
And because there are added in this apparatus, handsome in appearance, and convenient and effective also, the ultra-violet currents, and those especially designed for powerful autocondensation and autoconduction, static, and different frequencies, far richer and more powerful than others, we may make our skiagraphs, rather negatives, to appear also in natural colors, if desired, and this can be obtained with a little more



Skiagraph of the hip made the usual way.—Bullet.



Skiagraph of the hip. No dislocation as supposed. Compression diaphragm. Tungstate of calcium screen.



Fracture of the femur—middle third.

Fracture of the femur. Reduced under the X-Ray.

work, longer exposure, and some patience in developing.

The advantages of such a method are certainly great. Just think, the muscles of a living human body, appearing deep in individual layers in their natural colors, the "blood-supply" of the same showing in red, and the bones white, with the most beautiful detail in construction of the substance, while the organs, as the heart, appear in scarlet, the different shades being of the most beautiful and the light contrasting with the shades of darker quality,—a living picture of a living subject with all the secrets of Nature and otherwise invisible to the human eye in the internal parts of the human anatomy, physiology, and pathology. Gold in such and similar negatives appears in yellow, silver (and that seems to be very important) in blue, and iron in black.

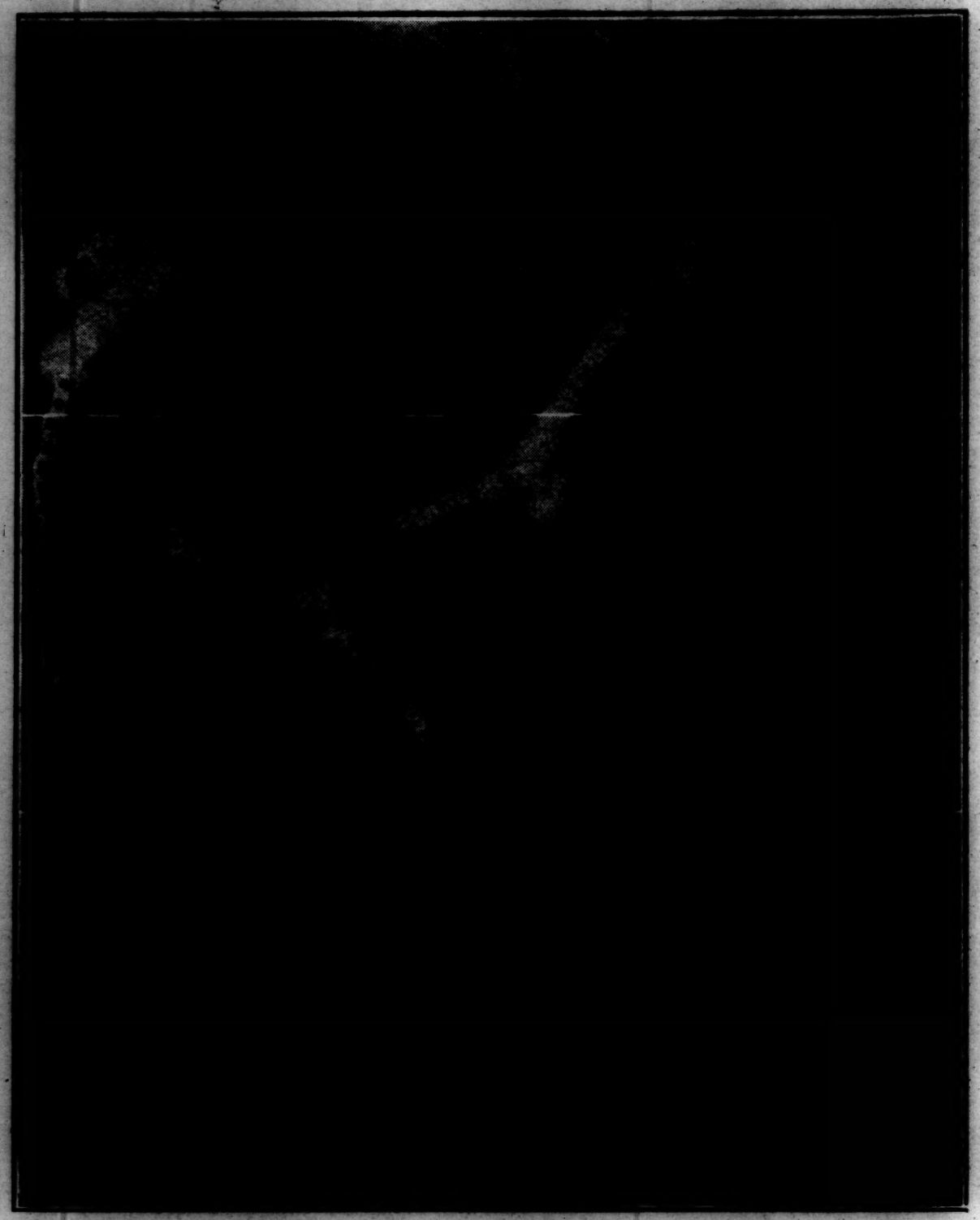
For this purpose we have to employ the Lumiére autochrom plates, especially made for direct color photography. They are sensitive to all colors, and must be handled by deep-red, dark-room light, to which they must never be directly exposed, and in unloading the same from the envelope we must immerse the plate at once in the special developer and keep the tray covered during the development, or develop first in complete darkness. *So far as yet we get only diapositives in colors, and colored prints cannot be made, but the pictures themselves are beautiful.* The exposure in this case differs from the usual one. The autochrom plates being exposed on the glass side, the rays therefore must go through the glass before reaching the sensitive and special film, and being filtered with the special yellow-glass screen of Lumiĕre, they have to be divided on account of the penetration of the *x*-rays proper, with our own filter, made especially for this purpose of aluminum. A lead plate placed under the photographic plate with the film protected with cardboard seems to concentrate the rays properly for the

rendering of correct colors. The autochrom plate for our purpose is exposed without the frame in yellow envelopes, not black ones, but care must be taken not to expose the plates in the beginning even to the red light of a dark-room, as said already. The ray filter is placed over the autochrom plate and our aluminum filter as near as possible to the tube. The development is special, certainly, lasting but a few minutes, and is then followed by a second development with dianol to reduce the silver. This second procedure is done in broad daylight, from the moment the permanganate solution for coloring purposes is poured on, as well as all further manipulations, as intensification, clearing, fixing, reversing the image, washing, drying, and varnishing. The last step is done in order to increase the brilliancy of the image and insure its preservation. See my article, "Is Radiography in Colors Possible?" in the September, 1908, Journal of Advanced Therapeutics.

Just for comparison, and to prove the value of the *x*-ray in surgery as the best means of diagnosis, see the negative of ours made the usual way on very short exposure with the help of the tungstate-of-calcium screen, but without the compression diaphragm. It shows the pelvic bones plainly and a bullet near the coccyx. The picture was taken through the dressings without any pain or discomfort to the patient, through the cloths, regardless of any swelling or inflammation which may mask the real condition and without general anesthesia. Here the foreign body, the bullet, is found without the dangerous probe, and the second negative shows us beyond doubt where to cut, the field being divided into square inches, the subject being placed in a certain definite position, and then a lateral view taken in the same manner to ascertain the depth. The injured part compared with the normal one under this circumstance and skiagraphed will secure for us the

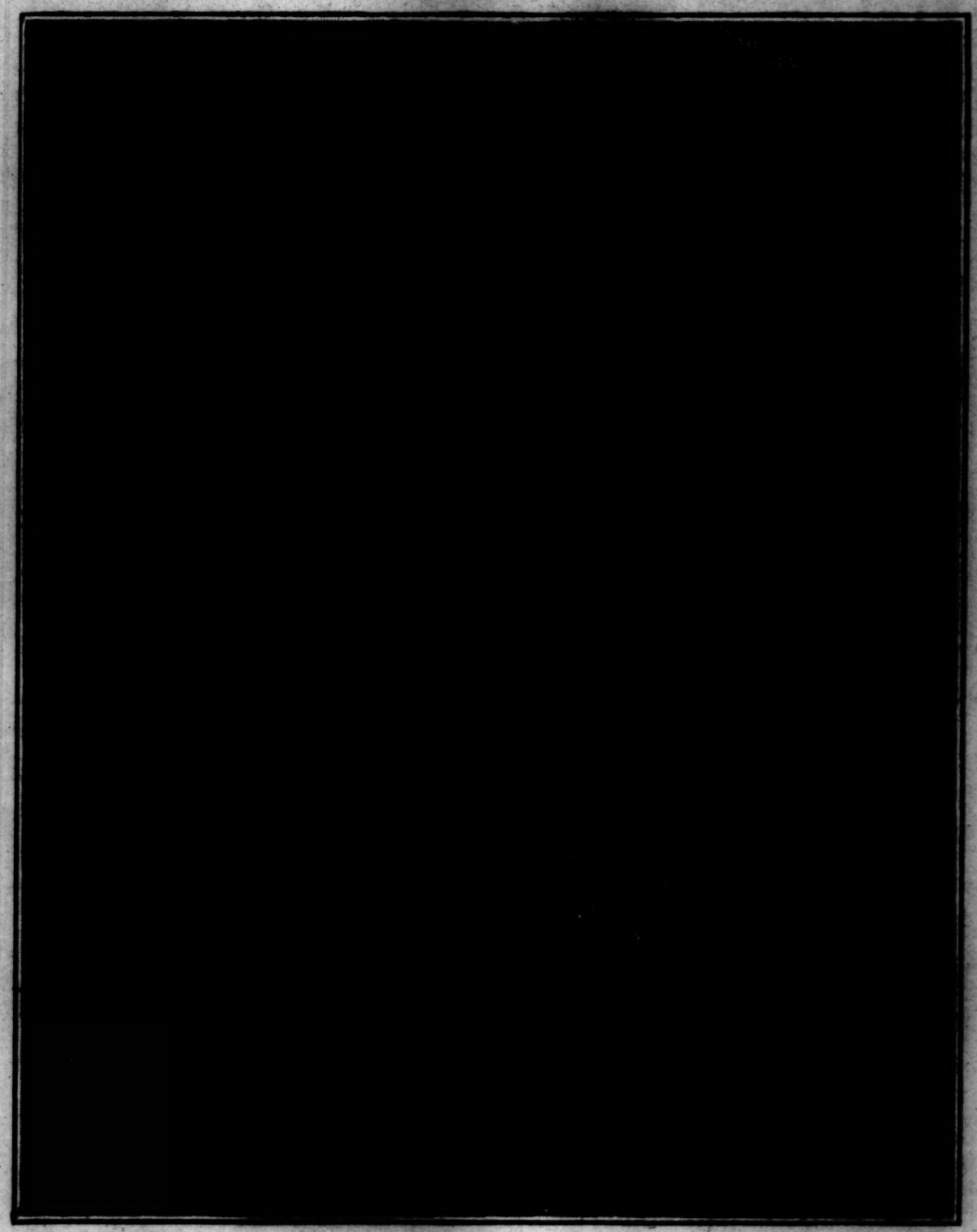
Normal foot. First attempt in colored photography. Lumier's plate. White field, red in color; background, blue. Diapositive; reprint in colors not possible.

Normal foot taken through the shoe with a "Victor."



Colored diapositives. Lumier's plates.

1. Muscles, red; bones, white; silver, blue; iron, dark.
2. Detail in bones. Gold, yellow.
3. Background, orange. Three plates.



19. Normal hand. Cramer's plate.

most useful record of our procedure before, during, and after the treatment.

In the other case, where we had to employ the tungstate-of-calcium screen and the compression diaphragm, six eminent colleagues were in consultation, four claiming that we had dislocation of the head of the femur and a fracture of the middle third of the same bone, and on the same side. Two were not certain, diagnosticating the fracture only. The *x*-rays had to decide the important question, and the conditions were disclosed correctly without the painful and unnecessary manipulation. As you observe in the negative, the hip-joint was perfect and normal, but the fragments of the femur fractured in the middle third not in position. Under the guidance of the Roentgen rays the surgeon in charge, observing the movements of the fragments, reduced the same and had them nearly in apposition when dressings were applied. Through the plaster-of-Paris the approximation of the fragments was seen, any deviation recognized, and later on the callus formation observed.

For the direct color photography we have exposed in the usual way a normal foot and photographed the same through the shoe, as you see. The second image was done with the special plate of Lumiére, the experiment being repeated many times. The picture shows a dominant black color, but with all the details in the substance of the bones, marked black shadows of iron parts and the individual layers of the shoe. It means either that the ray-filter has not been correctly placed in position, or that our rays went through a black envelope before reaching the sensitive film. We therefore enveloped new autochrom plates, each in an orange envelope only, avoiding scratching of the film, which is very delicate, and exposed a normal hand with a pocket-book on a chain. Inside we had a smaller pocket-book, with a dollar and two ten centers, silk handkerchief, silk string, a few keys, and a knife. We

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have spoiled many plates, and made also a usual negative on a common *x*-ray plate, for comparison. Finally our efforts were crowned with the most beautiful result, and we made out of thirty-six special plates one, and a good one, and found that even in skiagraphy nothing is impossible. This wonderful discovery of special plates, by which color photography is made absolutely certain, has struck the world with awe and amazement, and we, the humble servants of science, can to-day demonstrate also some future possibilities in our line with these plates. The whole procedure is simple, and it is to be hoped that in the near future we shall be able to make our skiagraphs in natural colors, to diagnose all the lesions of the bones, the destruction of the tissues with a foreign body, show different growths in the stomach and other parts of the body, any lesion where there is a marked congestion, pus in cavities, or some destructive process, especially in the lungs and other organs, accumulation of mineral salts, etc., and this all in natural colors—colors of life, affording opportunities for the study of comparative anatomy and other scientific questions concerning human life.

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